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DOMINION OF CANADA—DEPARTMENT OF AGRICULTURE

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FARMING IN THE IRRIGATION DISTRICTS OF ALBERTA

BY

C. C. SPENCE, B. H. KRISTJANSON
AND J. L. ANDERSON



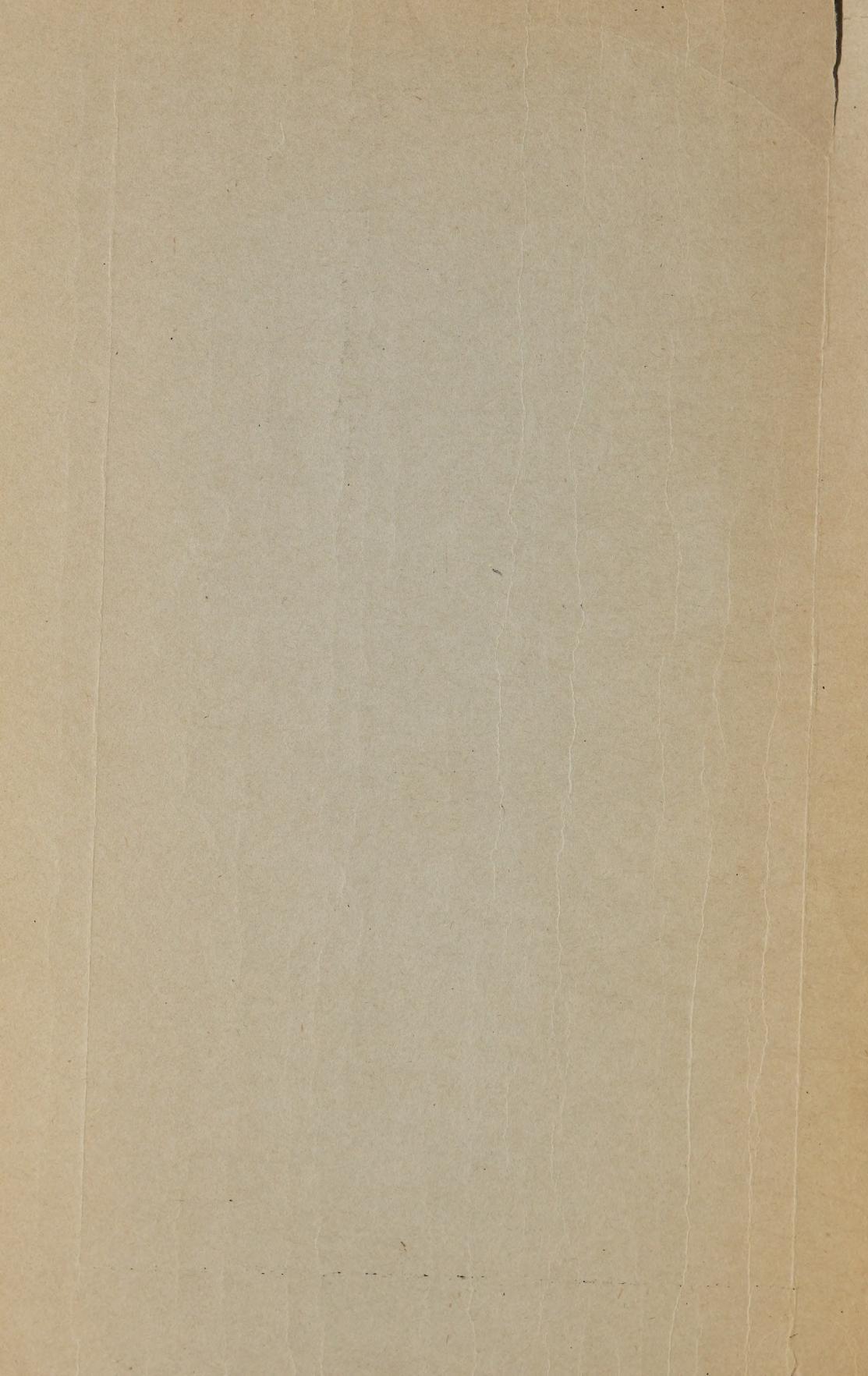
MARKETING SERVICE, ECONOMICS DIVISION,
DOMINION DEPARTMENT OF AGRICULTURE

IN CO-OPERATION WITH

THE DEPARTMENT OF POLITICAL AGRICULTURE
UNIVERSITY OF ALBERTA

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FOREWORD

This study of Farming in the Irrigation Districts of Alberta was begun in June, 1940, as part of the larger enquiry into the economic and social problems associated with the present utilization of land in the Prairie Provinces initiated in 1935 with the passing of the Prairie Farm Rehabilitation Act.

The organized field survey was conducted during the summer months of 1940 and 1941, with the greater number of the farms being covered in the former year. W. D. Porter, then officer-in-charge, Dominion Economics Division, University of Alberta, was directly in charge of the organization of the study and the conduct of the field survey and was assisted in the field enumeration for varying periods by B. K. Acton, J. L. Anderson, S. Boone, J. R. Bowring, W. Bredo, A. H. Harrison, S. Lane, D. A. B. Marshall, P. McRorie, M. C. Urquhart, and J. H. Younie.

Splendid co-operation was received from the several hundred farmers and from the irrigation officials and others interviewed.

A. E. Palmer and other officials of the Dominion Experimental Station at Lethbridge have given freely of their time and advice throughout the study.

Professor Andrew Stewart of the Department of Political Economy, University of Alberta, has been associated with the project since its inception and aided Mr. Porter in the preparation and submission to the St. Mary and Milk Rivers Water Development Committee of material assembled by the survey.

Information gathered in the survey has been published in articles, which have appeared from time to time in the Economic Annalist.

The association of the Senior author with the study was that of supervisor of the larger enquiry into problems associated with present land use in Western Canada, but the later analysis has been done under his direction and for this and the preparation of the report he is directly responsible. In this phase of the project he was assisted by B. H. Kristjanson, and J. L. Anderson.

To all who have aided in and contributed to the study the authors are indebted.

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FARMING IN THE IRRIGATION DISTRICTS OF ALBERTA

C. C. SPENCE¹, B. H. KRISTJANSON², AND J. L. ANDERSON³

INTRODUCTION

Irrigation as an aid in the production of crops in Alberta is practised on less than three per cent of the improved acreage of the province, and it is of major importance on not more than five per cent of the farms. Yet, in terms of the annual gross farm revenue in several successive years during the thirties, the production on these irrigated farms accounted for almost ten per cent of the total for the province. Most of these farms are in the twelve irrigation districts of Alberta; the others are individual projects scattered throughout the south. The irrigation districts are located in the southern part of Alberta in areas tributary to the Waterton, Belly, St. Mary, Oldman, Bow, and Red Deer Rivers, which have their sources in mountain streams and provide the water for irrigating. The districts vary in size from 160,000 acres under irrigation in the Eastern Irrigation District to less than 3,000 acres in the Little Bow District.⁴

The earliest irrigation project in Alberta undertaken on a tract of land as large as 15 acres was in 1879. This was by John Glen at Fish Creek, 8 miles south of Calgary on section 3, township 23, range 1, west of the fifth meridian. Shortly afterwards a number of ranchers began irrigating small patches of land to provide a sure source of food and feed. In 1894 the North West Irrigation Act was passed by the Parliament of Canada and following this, extensive surveys were carried out by engineers under the Dominion Government. From these early surveys were developed a number of projects now in operation. In addition to the larger projects of the organized districts, there are about 590 individual small projects serving an estimated 68,000 acres of land. It was because of the proximity of sources of water, of risky crop growing conditions in areas of comparatively light rainfall, accompanied by a relatively high rate of evaporation, of a combination of fertile soil and topography relatively favourable for irrigation, that the development of the large irrigation projects was begun at an early stage in the history of the agriculture of the province.

Closely associated with the development of all irrigation projects was colonization. Some projects were undertaken for the purpose of bringing in new settlers to take over lands held by companies entrusted with colonizing them; others, in order to save colonies already established. Private corporations, governments, communities, and individuals contributed to the promotion and development of these projects.

More than four decades have now passed since the first organized efforts were made to establish irrigation farming in Alberta. During these years some efforts have met with success; while others have been disappointing. More

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² Formerly Agricultural Assistant, Dominion Department of Agriculture.

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⁴ An irrigation district is a contiguous area in which several farmers are provided with water from a common source for irrigating and the control of which is vested in an organization set up for the purpose. Such an organization is responsible for the levying and collection of all water rates and charges against those under contract to take water.

than one-half million acres of land are now under irrigation in southern Alberta, and plans are being considered for further development of an area of more than double this acreage, and thus to provide for the establishment of at least another four thousand irrigated farms. It is for this reason that a study of the economics of irrigation farming was considered essential at this time.

PURPOSE OF THE STUDY

The study¹ was undertaken by the Economics Division, Marketing Service, Dominion Department of Agriculture, in co-operation with the Department of Political Economy at the University of Alberta:

- (1) to segregate and analyse the factors in farm management having the greatest influence on successful irrigation farming in Alberta;
- (2) to determine what net revenue could reasonably be expected from irrigated land under varying conditions of farm organization, for retiring debts, and for savings; and
- + (3) finally, to evaluate the difference in productivity and unit income of the irrigated areas compared with dry land areas.

AREAS COVERED BY THE STUDY

The general location of the areas specifically covered in this business study of irrigation farming is indicated in Figure 1. These include four irrigation districts and part of a fifth, namely: (1) the Eastern Irrigation District which occupies a large block of land between the Red Deer and Bow Rivers and almost half-way between Calgary and Medicine Hat; (2) the Canada Land and Irrigation District, situated south of the Eastern Irrigation District and between the Bow and the Oldman Rivers; (3) the Taber District located approximately 30 miles east of Lethbridge and south of the Oldman River; (4) the Coaldale area which is part of the Alberta Railway and Irrigation District, located directly east of Lethbridge; and (5) the United Irrigation District located in west-southwestern Alberta between the Belly and the Waterton Rivers.

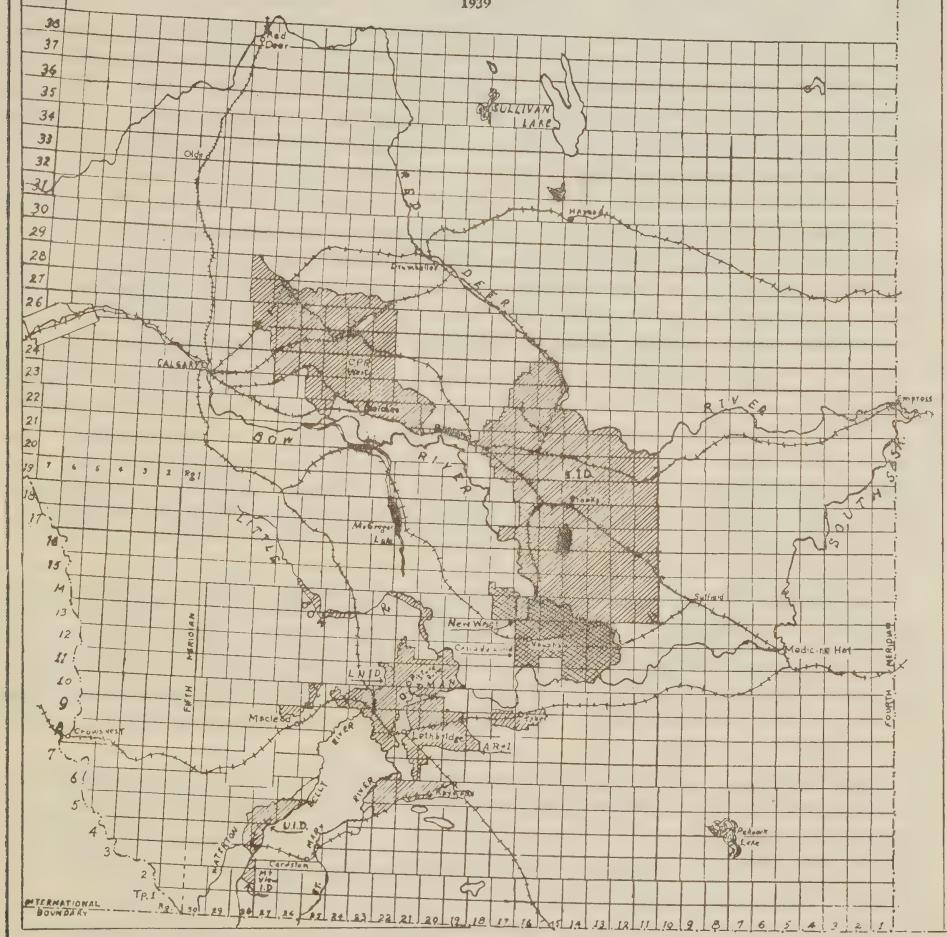
Eastern Irrigation District.—The Eastern Irrigation District is estimated to contain 250,000 acres of irrigable land, of which approximately 160,000 acres of land were irrigated in 1942, and covered by water contract. The source of the water is the Bow River. Constructed and managed by the Canadian Pacific Railway Company to settle people on a land otherwise too dry for successful settlement, this project was the largest undertaken in Alberta. In 1935 the Company transferred its interests in this irrigation project to the people of the Eastern Irrigation District through a board of trustees appointed to administer the project. While including a large territory possibly one and one-half million acres, the irrigable area of the Eastern Irrigation District consists of only about one-sixth of the total area of the District. The irrigated portion extends in more or less irregular patches throughout the District according to the contours of the land and ease with which water can be distributed.

Farms in five sub-districts within the Eastern Irrigation District were covered in the survey, namely: those around Brooks and Tilley where some emphasis is placed on peas and seed production; those around Rosemary where emphasis is placed on dairy production; and those distant about 30 miles south of Brooks, at Scandia, which emphasize livestock production and feeding.

¹ The major portion of funds to carry out this project was provided out of appropriations for the Prairie Farm Rehabilitation Act. Funds were also provided from a grant to the University by the Alberta Department of Agriculture for farm economics research.

In addition to these a number of farms in another sub-district of the Eastern Irrigation District were included. This sub-area is known as the Rolling Hills district. On account of its being a resettlement and rehabilitation project, and of a very recent date, the study of the farms in the Rolling Hills area is treated separately in the report.

FIG. 1
LOCATION AND EXTENT
OF IRRIGATION WORKS
IN ALBERTA
1939



The Canada Land and Irrigation and New West Districts.—South of the Eastern Irrigation District, beyond the Bow River, lies the Canada Land and Irrigation District. This comprises 41,500 acres of irrigable land covered by water contract. A little over 32,000 acres were irrigated in 1939. The source of the water for irrigation is the Bow River and it is diverted at a point about 50 miles southeast of Calgary. The authority for diverting, storing, and distributing the water is vested in the one organization. The natural factors conducive to irrigation are similar to those of the Eastern Irrigation District and like crops can be grown. The major enterprise is grain production, with

emphasis on wheat, but in recent years raising and feeding of livestock has been given increased attention. It is because of the emphasis on grain production under irrigation that the area was selected for special study.

The farms in the New West Irrigation District were also studied. This District is adjacent, on the west, to Canada Land Irrigation District and is supplied with water for irrigation by the latter District. In the distribution of water and other matters, however, the District is a separate entity. The type of farming is similar to that carried on in the Canada Land Irrigation District.

Taber Irrigation District.—The Taber Irrigation District comprises approximately 21,500 acres of irrigable land, all of which is covered by contract, and in most years practically the whole irrigable acreage is irrigated. Between 4,000 and 6,000 acres will be added to this as soon as the eastern extension now under construction is completed. Water is supplied to the Taber Irrigation District by the Canadian Pacific Railway, through an extension of a system which supplies the Alberta Railway and Irrigation District to the west. For this purpose, the water is diverted from the St. Mary River. The Taber District is located about 12 miles south of the Canada Land and Irrigation District.

The production of specialty crops, chiefly beets and canning crops, bringing relatively high returns per acre, characterizes the Taber District, and it is for this reason the area was included in an economic study of irrigation farming.

Coaldale Area of the Alberta Railway and Irrigation District.—A few farms in the irrigation district immediately east of Lethbridge were also included in this study. These farms are located around Coaldale, a sub-area in the irrigation district commonly known as the Alberta Railway and Irrigation. The source of the water is the St. Mary River, and its diversion, storage, and distribution is handled by the Canadian Pacific Railway. In respect to natural and economic factors conducive to irrigation farming the Coaldale District is quite similar to Taber.

The United Irrigation District.—The United Irrigation District contains approximately 63,000 acres of which slightly more than 34,000 acres can be irrigated and are covered by water contract. In 1939, irrigating was done on about one-third of the irrigable acreage. Water for irrigating is obtained from the Belly River. The authority for diverting, storing, and distributing the water is vested entirely in the United Irrigation District.

On account of its nearness to the mountains and consequent higher elevation, compared with other irrigation districts, the mean temperature is slightly lower and the growing season relatively shorter. The precipitation is somewhat greater in the United Irrigation District than in the other districts included in these farm business studies. On two sides it is bordered by areas which under dry land farming methods have developed a relatively prosperous agriculture. For this reason, the area was selected for special consideration in this study.

METHOD OF STUDY

The field survey was made during the summer and fall of 1940 and early summer of 1941. In all there were 550 farms visited. Each farm operator was interviewed by an enumerator who had a specially prepared questionnaire for recording the information. In addition to the information obtained from the farmers a considerable amount of material was assembled from records compiled in the several district offices of the irrigation companies. For the United, Taber, Canada Land, and New West Irrigation Districts the information on the farm business pertains to the year ended June 30, 1940. In the other districts fewer farms were visited, and the information relates to the following year ended May 31, 1941. Yields were fairly constant during the two years and prices for crops remained about the same. There was some increase in livestock prices, during the second year but possibly no more than to take care of the slight increase in farming costs. For practical purposes from the point of time, it was considered that the farm businesses were fairly comparable; and in studying some of the relationships, information from the farm businesses of the two years was combined in the groupings.

Of the 550 statements on farm businesses 500 were thought to be sufficiently reliable and representative to be usable for general analysis. In analysing these statements the simple comparative method has been used. The chief measure used has been the arithmetic average and while there are weaknesses in its use, this average is probably as satisfactory as any, and it has the advantage of being most commonly understood.

CLIMATE

In general, southern Alberta has a north temperate, continental climate. The extremes associated with such a climate, however, are somewhat modified by the presence of the Rocky Mountains to the west. At Brooks the altitude is 2,485 feet above sea level and this is about 1,000 feet lower than at Calgary, nearer to the mountains. Due to this difference in altitude the precipitation is lower and the mean temperature slightly higher at Brooks than at Calgary. Throughout, the region is characterized by a low annual rainfall accompanied by a high rate of evaporation caused by a combination of winds and high summer temperatures. During the summer months the days are bright and long, and the nights are cool and comparatively short.

Precipitation.—Yearly precipitation at several points in the irrigation region for a 15-year period, 1926 to 1941, is shown graphically in Charts 1 (a) and (b). The precipitation for the same period at Pincher Creek and at Jenner is also charted. The former lies to the west of the present irrigated region only 15 miles distant from the United Irrigation District, while the latter lies to the east less than 10 miles from the Eastern Irrigation District. The average annual precipitation for the 15-year period at Pincher Creek was about 20 inches while at Jenner for the same period the annual precipitation averaged less than 12 inches.

Variability in the annual precipitation is quite marked at all points, but the significance of this is greater in the areas of lower precipitation. At no time do these areas receive much more than the bare minimum necessary to carry through cereal crops. This marginality with respect to precipitation, exists in spite of its comparatively favourable distribution, most of it occurring during the months of April to October. It is during these months precipitation is most effective for crop growth.

For the following points, within or near the irrigation districts, the proportion of the total annual precipitation of the previous fall and the growing season was as follows: Pincher Creek, 78 per cent; Calgary, 82 per cent; Lethbridge, 77 per cent; Gleichen, 79 per cent; and Gem, 70 per cent. Throughout the area the seasonal precipitation is quite variable. This is illustrated in Table I which gives the precipitation at Taber for the 7 months April to October since the irrigation project was established.

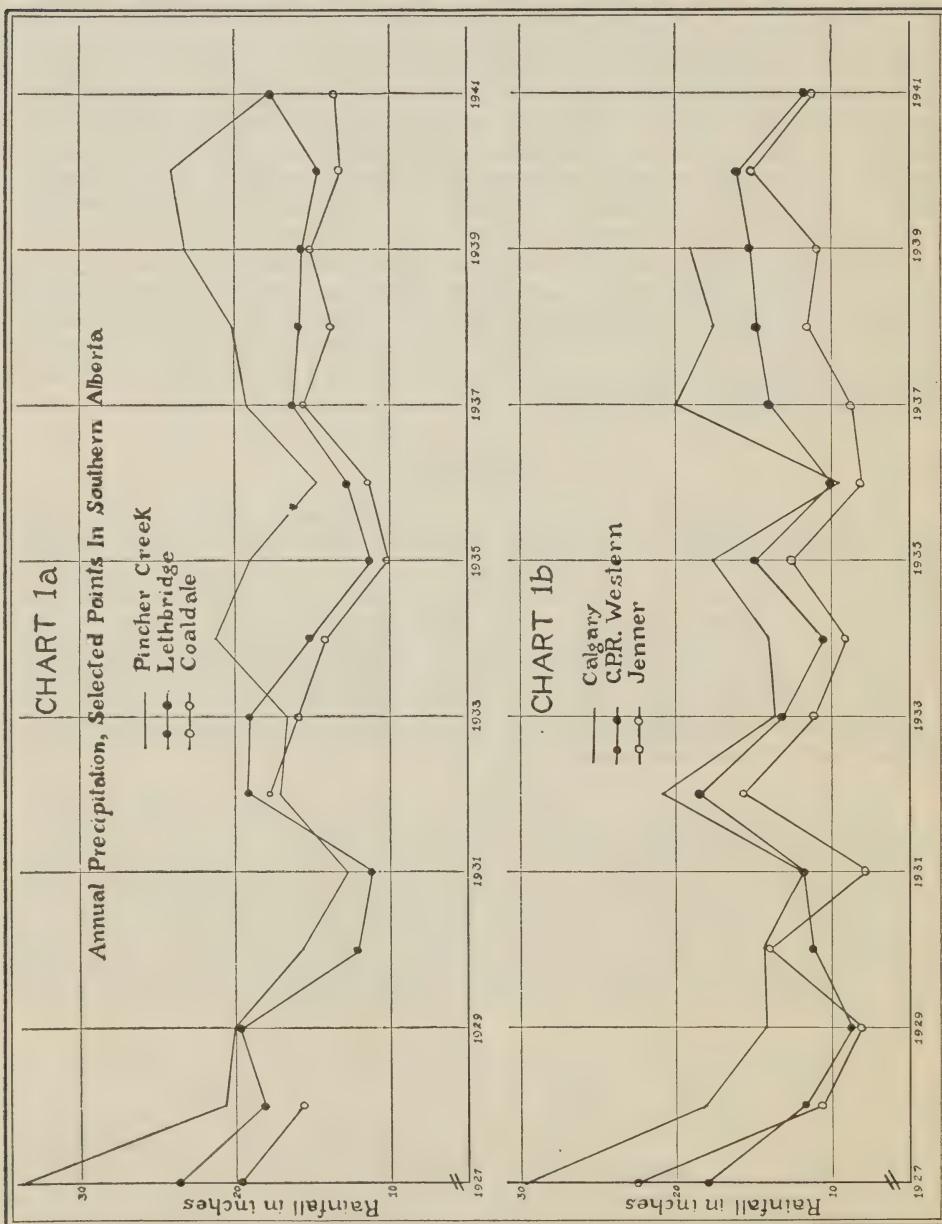


TABLE 1.—SUMMER RAINFALL RECORD SINCE CONSTRUCTION OF TABER PROJECT FOR THE SEVEN MONTHS, APRIL TO OCTOBER, INCLUSIVE

Year	Inches	Year	Inches
1920.....	10.26	1931.....	7.82
1921.....	8.40	1932.....	14.22
1922.....	9.62	1933.....	12.91
1923.....	13.31	1934.....	10.54
1924.....	11.05	1935.....	8.03
1925.....	14.43	1936.....	6.96
1926.....	14.04	1937.....	5.65
1927.....	17.94	1938.....	8.64
1928.....	14.81	1939.....	8.63
1929.....	14.17	1940.....	9.45
1930.....	9.87	1941.....	9.75

It will be noted that since 1919 for one-half of the years the April to October rainfall was less than 10 inches. The highest precipitation in any one year occurred in 1927, when it amounted to approximately 18 inches. This amount, however, was higher by almost 4 inches than in any other of the more favourable years.

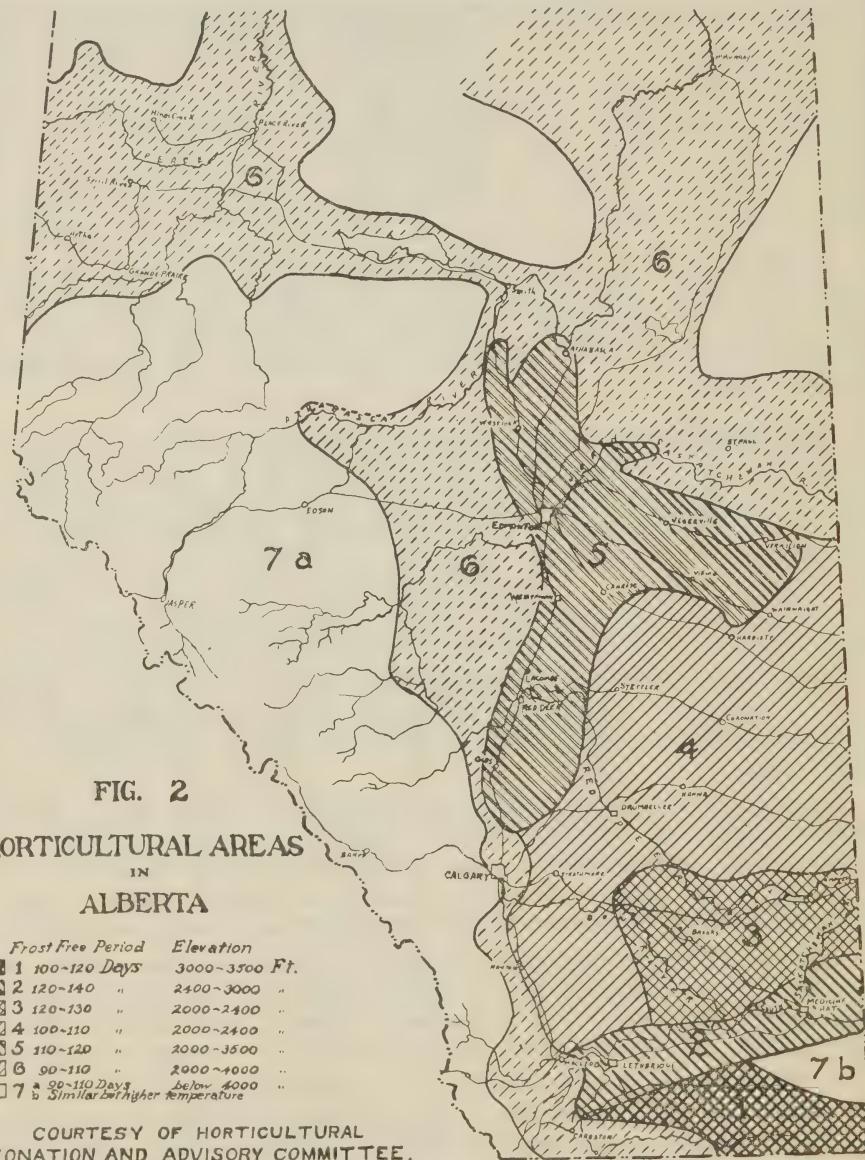
Temperature.—The mean annual temperature for the last 40 years at Calgary was approximately 39° F., at Lethbridge 41° F., and at Medicine Hat 43° F. The warmest month was July and for Medicine Hat the maximum mean at 86° F. was more than 8° above that at Calgary; the minimum means for the same month indicated about the same spread. The coldest month was January. The mean minimum for this month for Calgary at 4.5° F. was only a fraction lower than that for Medicine Hat. Thus at the more easterly point there is a somewhat greater range in temperature but in general slightly higher (Figure 2).

It may be concluded that travelling from west to east across the irrigation region of southern Alberta the temperature becomes somewhat higher; and results in a longer frost-free period in the eastern part of the region than in the western part.

Common to this whole belt is the occurrence of warm, dry winds which frequently blow from west to east and exaggerate a situation already set for a high rate of evaporation due to an inland location. The incidence of these warm, dry winds appears greater in some areas than in others. Thus the Macleod-Lethbridge area is particularly susceptible to the action of these winds.

From the foregoing description of the precipitation and temperature within and around the irrigation region of southern Alberta, it is evident that those areas to the east receive less precipitation than do those farther west; the temperature is also higher; and in general the rate of evaporation greater.

In any region of such broad expanse as southern Alberta, with an altitude in a plains area rising from two to four thousand feet above sea level, and bounded on one side by a range of mountains, it is obvious that local differences in temperature and precipitation occur. Such a difference may be noted in the area to the west adjoining the Cypress Hills in the southeastern part of the province. The results of such local difference show up in differences in productivity where the soil and other physical characteristics of the area in general are similar.



PHYSICAL CHARACTERISTICS

The Soil.—The importance of the soil in the economics of irrigation farming is determined by a number of factors. Among these is the degree of the aridity of the irrigated area. In areas of light precipitation but not too extreme, dry farming can compete with irrigation farming where the texture of the soil is relatively heavy—the clay loams and the clays. The heavier-textured soils have greater water-retentive capacity than have the lighter ones—sandy loams.

In areas where the sparsity of precipitation is marked to such an extent that irrigation becomes necessary to carry on arable farming the lighter-textured soils are favoured. This is particularly true in the production of root crops and other intensively grown crops.

Another factor is the presence of certain alkali salts, and the structure of the soil which permits these to accumulate and form unproductive spots.

The United Irrigation District for example is characterized by medium to heavy-textured soils which were formed in the beds of post-glacial lakes and, on such soils, there is a danger of 'puddling' and difficulty in cultivation. On the other hand lighter-textured soils such as are found in the vicinity of Taber are more readily cultivated, and are to be preferred in the production of roots and other crops grown intensively under irrigation. Under dry land farming, however, the heavier-textured soils are preferred because of their greater water-retention capacity. On such soil it may be expected that dry land farming will compete with irrigation farming except in areas where the more intensive types of agriculture can be carried on.

In the Eastern Irrigation District and the Canada Land Block loams and silt loams of the "blow-out" phases predominate. "Blow-out" soils are poor agricultural soils under dry land farming. Under irrigation they appear to be otherwise. Concerning these the soils specialists make this observation. ". . . under irrigation the hard impervious B horizon seems to have partially broken up so that water and root penetration is not so difficult. The blow-out soils are higher in alkali salts than the normal soils. . . . In general, however, these soils are fairly good irrigation soils."¹

A combination of flooding and poor drainage will result in an accumulation of alkali salts where these are present. Such concentration will make the land unproductive. While these alkali accumulations are more likely to be brought about in the sandy soils, they may occur in all soils.

An approximation of the extent of the various soil textures within six irrigation districts is presented in Table 2. These have been calculated from available soil maps. The soils of the Taber area are generally of a light to a medium texture while those of the United Irrigation District are decidedly heavier.² The soils in the other districts under review are generally of a medium texture—loams and silt loams. Such intermediate-textured soils are well adapted to irrigation. They absorb water freely and possess fairly high retentive power. In addition to the favourable texture, these soils are comparatively high in limestone and consequently are well adapted to the growth of legumes.

Legumes improve the soil not only from a physical standpoint, due to their deep rooting and return of organic matter to the soil, but also add fertility to the soil in the nitrogen fixation processes, as well as in the foundation of a systematic rotation with livestock.

¹ Wyatt, F. A., et al, "Soil Survey of Rainy Hills Sheet", page 37, University of Alberta Bulletin 28, Edmonton, Alberta, 1937.

² It should be pointed out that the data in Table 2 are not necessarily representative of all land under irrigation in Alberta. The data cover only the districts included in the farm business study.

TABLE 2.—DISTRIBUTION OF SOILS BY TEXTURE IN SIX DISTRICTS UNDER IRRIGATION IN ALBERTA, 1942¹

Soil Texture	Eastern Irrigation	Canada Land	New West	Taber	Alberta Railway and Irrigation	United Irrigation
	%	%	%	%	%	%
Clay.....	1.4				0.7	27.5
Silty clay loam.....					30.1	33.0
Clay loam.....	4.3	1.4	18.2		19.0	
Silt loam.....	24.9			8.1	55.5	
Loam.....	36.3	37.2	81.1	69.3	12.6	14.6 ²
Fine sandy loam.....	14.0	32.4		7.6		
Sandy loam.....	6.6					
Fine sand.....	2.6	9.1	0.7	10.4		
Sand.....	2.8					
Marshes, lakes, etc.....	7.1	19.9		4.6	1.1	5.9
	Ac.	Ac.	Ac.	Ac.	Ac.	Ac.
Total area by district.....	1,500,000	200,000	8,000	33,200	110,500	62,800

¹ Calculated from planimeter scaling on available soil maps prepared by the Department of Soils, University of Alberta.

² The loams are 8.0 per cent gravelly phase and 6.5 per cent of the heavy loam phase.

Topography.—The topography of the region as a whole is not a barrier to the utilization of the water available for irrigation. The sections which have been irrigated are level and undulating to gently rolling; but the proportion of the total area contained in organized districts which has been considered suitable for irrigation is only one-third of this total.

The ease with which land may be irrigated depends on the nature of the topography. The long gently sloping fields are those most easily and economically irrigated. Man cannot remake the general slope of the land but he can by levelling make more of this slope irrigable. Levelling, too, with the "blow-out" soils fills in the depressions, smooths off the hummocks and thereby distributes more evenly the productive soil.

POPULATION AND THE PEOPLE

Population.—While irrigation, even in organized districts has been carried on since the early years of the settlement of the province, the greater part of its development has taken place since the Great War of 1914-1918. Therefore, in tracing the population growth which may be attributed, in part at least, to irrigation, 1916 would appear to be the census year most indicative of the beginning of any trend in population movement due to irrigation. Population figures have been compiled for representative irrigation districts from the census figures given by townships for each census year from 1901 to 1936 and are given in Table 3.

Since 1916 population numbers have increased greatly in all districts except Taber; but even in the Taber District the 1936 population was 45 per cent greater than in 1916. In the earlier years there was a large coal mining industry near Taber which accounts for the relatively large population of 1916. The mine has been closed for a number of years. It is interesting to note that the increase in population for the whole province during the same 30-year period was also 45 per cent; however, that of southern Alberta increased only 30 per cent. In fact there was a decrease in the population in a number of townships in southern Alberta during the latter part of this 30-year period.

TABLE 3.—POPULATION TRENDS IN THE IRRIGATED DISTRICTS INCLUDED
IN THE FARM BUSINESS STUDY AND FOR THE PROVINCE, 1901 TO 1936¹

	1901	1906	1911	1916	1921	1926	1931	1936
								No.
Irrigation District..	63	2	1,793	1,412	3,698	3,035	4,548	6,365
Land.....	6	10	181	95	410	358	925	1,029
Up 9, range 20 and age of Coaldale ²	6	59	254	241	560	581	1,089	1,332
Up 9, ranges 16 and , and Town of Taber ³	5	826	1,891	1,821	2,376	2,170	2,453	2,652
Ownership 5, ranges 26 and 27 ⁴	37	90	272	280	367	617	704	799
Province of Alberta.....	73,022	185,195	374,295	496,442	588,454	607,599	731,605	772,782

¹ Source: Census, Dominion of Canada, 1936.

² Not reported.

³ Selected to represent the Alberta Railway and Irrigation District trends.

⁴ Selected to represent the Taber Irrigation District trends.

⁵ Selected to represent the United Irrigation District trends.

An increase in population of course, is to be expected with the changing over from dry land to irrigation farming. Irrigation will provide for a greater density in population. The advantages in this are not only economic but social.

Settlers.—The earlier settlers of the irrigation areas were immigrants from the British Isles and the United States, while the settlers of the twenties were made up for the most part of people from Central and Southeastern Europe. Of the various racial origins the United Irrigation District contains the largest proportion of British descent, a large number having migrated from the United States. Less than one-third of the settlers of the Eastern Irrigation District as well as Coaldale were of English, Scotch, or Irish ancestry. In the same districts a somewhat larger proportion were of German and Scandinavian nationalities, the Germans being the larger nationality group.

To a marked degree the Canada Land District was developed by settlers of either British, Scandinavian, or Russian origin, about one-third being British, one-fourth Scandinavian, and another fourth Russian. These nationalities account for practically the entire population of this District. Fifteen per cent of the settlers were born in the United States and another 15 per cent in Canada. Of the latter group one-third were born in Alberta.

In the Taber District, settlers of British descent made up almost 40 per cent of the total, while Scandinavians represented a little over 20 per cent of the population. Immigrants from Czechoslovakia and Hungary accounted for most of the remainder. The one significant difference in the national origins of the settlers in the Taber District compared with the Canada Land was the comparatively large number of Russians in the latter district and the correspondingly large proportion of settlers from Czechoslovakia and Hungary in the Taber District. Approximately 30 per cent of the population in the Taber District came from the United States, these being for the most part from Utah and Arizona. The proportion of Canadian-born residents is about equal in both Districts, that is, 15 per cent of the total.

There was a slight difference in the amount of experience which the settlers in these two Districts had acquired prior to taking title to the farms. Most of those coming to the Canada Land District had no previous experience with farming irrigated land, most of them had farmed on dry land. On the other hand, viewed from the standpoint of the experience with irrigation farming which the operators had gained prior to assuming the responsibilities of operating a

farm, the Taber District has had an advantage over the Canada Land District since many settlers in the Taber District made their initial appearance as beet-workers, that is, as hired help on beet farms.

Comparing further the two Districts, Canada Land and Taber, the average ages of the operators at the time of this survey were 45 and 43 years respectively. In the latter over one-half were between 20 and 29 years of age when coming to Canada while only one-third of the operators in the Canada Land District were in this age group, the remainder being about evenly divided between those less than 20 years of age and those over 30 years old. These immigrants in both Districts came directly to Alberta and have remained in the province since that time, or about 24 years on the average.

MARKETS AND TRANSPORTATION

Markets.—The question of markets is of paramount importance to any irrigation project. Several markets are required to handle the variety of produce grown, and in this respect, Alberta irrigation projects are no more fortunate than projects in some other countries. Distances, coupled with transportation costs, are a limiting factor in accessibility to markets. Tables 4 and 5 give the distances to markets and the freight rates which apply to Alberta irrigation produce.

TABLE 4.—DISTANCES TO MAJOR MARKET OUTLETS FOR PRODUCE FROM THE IRRIGATED DISTRICTS OF ALBERTA¹

Shipping Points	Rail Miles	Highway Miles
Medicine Hat to Calgary.....	180	195
Medicine Hat to Lethbridge.....	112	106
Vauxhall to Medicine Hat.....	76	98
Vauxhall to Calgary.....	147	150
Lethbridge via Macleod to Calgary.....	126	141
Calgary to Edmonton.....	194	192
Calgary to Vancouver.....	642	795
Calgary to Winnipeg.....	840	893
Calgary to Fort William.....	1,266	.....
Calgary to Toronto.....	2,072	.....

¹ Data from railroad schedules and Alberta Motor Association road maps.

TABLE 5.—FREIGHT COSTS IN CARLOAD LOTS FROM CALGARY TO VANCOUVER AND FORT WILLIAM¹

	From Calgary to		Minimum Cars
	Vancouver	Fort William	
	Cents per cwt.	Cents per cwt.	lb.
Grain: Export.....	20.0	.....	80,000
Domestic.....	41.5	26.0	80,000
Livestock (cattle, hogs and sheep).....	56.0	67.0	20,000
Honey and canned goods.....	98.0	141.0	24,000
Cheese, eggs, and fresh meats.....	110.0	143.0	24,000
Butter and dressed poultry.....	145.0	192.0	20,000
Packing house products.....	98.0	129.0	24,000
Potatoes.....	59.5	76.0	40,000
Mixed vegetables.....	59.5	81.0	40,000
Alfalfa meal and pea seed.....	56.0	75.0	30,000

¹ Data obtained from offices of Canadian Pacific Railway, Edmonton, Alberta.

In common with other areas of the prairies a surplus of grain above local requirements is produced to be marketed elsewhere in Canada or for export. In the irrigated areas generally, too, a surplus of hay is produced. During the drouth years of the thirties a seller's market prevailed for hay. Usually it is more profitable to feed both hay and grain locally or in other words market it through livestock. In some irrigated areas, the by-products from the processing of specialized crops have stimulated livestock feeding since the feed is both inexpensive and of a high quality.

The markets for specialty crop produce from Alberta irrigation areas are largely limited to those of the Prairie Provinces because of competition in the more remote outlets. Markets for the more perishable products are more or less confined to those at Lethbridge, Calgary, Medicine Hat, and the local towns within the districts.

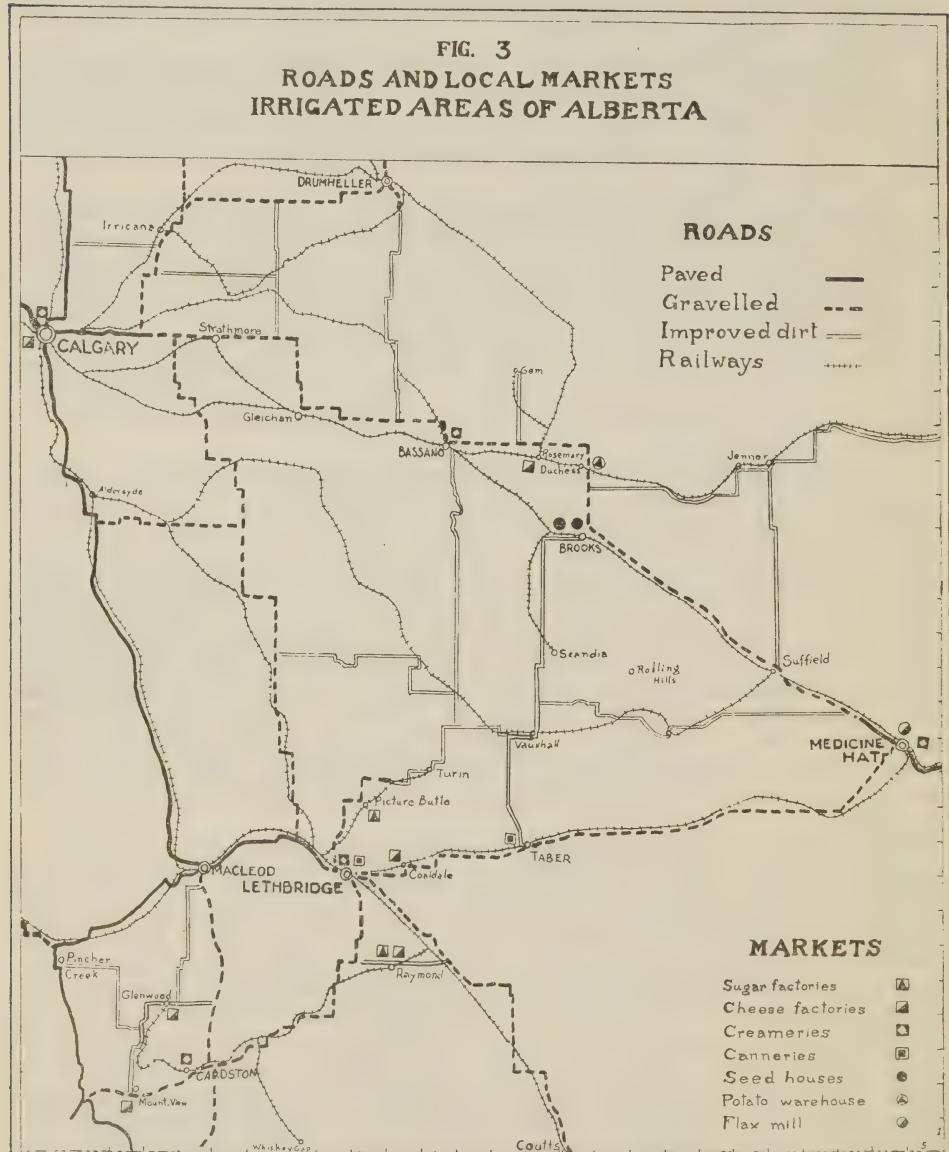
The railway freight rates which apply to packaged goods of less than car-load lots vary to a slight degree between local markets. These rates are usually directly related to the length of haul. For example, from points such as Brooks and Lethbridge the rate to Calgary is 30 cents per hundredweight. The distances are about equal. From Calgary to Medicine Hat the charge is 35 cents and the distance is about 50 miles greater than that from Brooks to Calgary. Rates between other intermediate points vary directly with the distance, a minimum charge being applied for very short hauls. Express charges are considerably higher but this service is used mainly for perishable goods or when speedy delivery is desired.

A limited number of industries have been established in the area. Sugar-beet factories are operating at Raymond and Picture Butte, and beets are grown for these centres in the Taber, Lethbridge, Magrath, Raymond, and Lethbridge Northern Irrigation Districts. Canning factories are operating at Taber and Lethbridge and cannning factory crops are grown in the irrigation districts adjacent to these centres. There is an alfalfa meal plant at Lethbridge and seed houses at both Lethbridge and Brooks. A large potato warehouse has recently been constructed at Duchess in the Eastern Irrigation District. The flax mill at Medicine Hat is serving as an outlet for the increase in flax production. Creameries and cheese factories at strategic points in the region are meeting the needs of the dairy industry (Figure 3). These industries have developed both as private and as co-operative enterprises. Their development has been and may continue to be gradual, providing a direct market outlet for the farmers.

The degree to which the present markets can be expanded or even held is debatable. Under present conditions of increased demands there will in all likelihood be fewer difficulties encountered since a large proportion of specialty crop foods consumed in the Prairie Provinces have been supplied from foreign countries and Eastern Canada. For example, Alberta is not producing sufficient sugar at the present time for the Western Provinces. This production could and would be increased if the Alberta beet growers could continue to enjoy the advantages of the domestic beet over the foreign cane sugar production made possible by wartime exigencies. While sugar beets are now being grown in Manitoba, Ontario and Quebec the real competition for sugar markets comes from cane sugar brought in from the West Indies and South Sea Islands. This is imported in the raw state at low duty rate and refined at the east and west coasts of Canada.

The future of the canning industry in Alberta should be at least as encouraging as that of the sugar industry. Production in Alberta is far short of meeting the requirements of the Western Provinces. Considering the transportation costs from a representative point in Eastern Canada to Winnipeg in relationship to the costs from Lethbridge to Winnipeg it may be noted that the shipper from

the latter point has an advantage. This differential is 12·0 cents per hundred-weight for the lake-rail haul and 31·5 cents per hundredweight for the straight rail haul¹. Thus the market opportunities for canned goods in Western Canada would appear to be fairly good, for the present, at least. This potential market should be examined with a view to expansion.



Any other method of processing vegetables and fruits which can be economically and satisfactorily used at the source of these products will help to widen the market for these products. Dehydrating and quick freezing plants are possibilities in this direction.

¹ Data obtained from offices of Canadian Pacific Railway, Edmonton, Alberta.

Transportation.—All Alberta irrigation districts are adequately served by highway and railway facilities (Figure 3). In addition to the local markets, the eastern and western markets are reached. Running parallel with the Canadian Pacific trans-Canada Railway and the Medicine Hat-Lethbridge line are gravel highways serving motor transport. These two highways are linked both by gravel and hard-surface highways from Lethbridge to Calgary. The Waterton Lakes-Lethbridge gravelled road serves the Raymond and Magrath districts and skirts the United Irrigation District. On the whole all these districts are served by a fine network of graded, dirt roads linking them with their local markets and distributing centres.

PRICES

The price index presented in Table 6 is designed to show as nearly as possible the price movements of the main products offered for sale by the farmers in the irrigated areas. For purposes of this index, the prices of wheat and flax were those received by the producers in the Canada Land District, while the sugar beet prices were those paid to producers in the vicinity of Taber. All livestock prices were based on the Calgary market.

TABLE 6.—INDEX NUMBERS OF FARM PRODUCTS, IRRIGATED AREA OF ALBERTA AND WHOLESALE PRICE INDEX FOR CANADA
1922 to 1942=100

Year	Products of Irrigated Area							Wholesale Price Index for Canada		
	Wheat	Flax	Sugar Beets ¹	Good Steers 1,050 pounds and over	Select Bacon Hogs	Good Hand-weight Lambs	Good Hand-weight Sheep	All Commodities	Field Products	Animal Products
1922.....	97	111	.....	81	106	118	124	113	114	110
1923.....	93	117	.....	85	91	130	136	114	103	106
1924.....	165	143	.....	88	84	140	158	115	117	108
1925.....	165	150	106	97	133	142	159	120	138	118
1926.....	145	111	99	100	145	125	135	116	141	111
1927.....	152	114	117	114	113	130	150	114	141	118
1928.....	106	122	117	154	101	131	147	112	131	127
1929.....	158	161	117	146	120	124	140	112	132	124
1930.....	65	72	99	106	123	92	86	101	98	114
1931.....	59	53	85	83	71	71	78	84	62	87
1932.....	39	36	88	72	43	52	54	78	58	68
1933.....	59	71	85	54	54	54	55	78	77	67
1934.....	80	64	85	65	81	62	65	84	76	76
1935.....	93	81	82	85	86	65	69	84	80	82
1936.....	112	102	90	71	84	74	58	87	93	83
1937.....	145	108	91	106	90	82	69	99	124	94
1938.....	80	79	88	86	97	81	76	92	97	90
1939.....	68	98	103	99	90	89	74	87	76	90
1940.....	65	68	103	110	107	99	81	96	79	94
1941.....	65	86	113	136	126	115	97	105	79	107
1942.....	93	143	131	165	149	129	100	112	93	121

¹ Eighteen-year base, only.

Sugar beet producers have enjoyed the advantages of a reasonably adequate price which has fluctuated less than the price of any other commodity (Table 6). Flax prices have fluctuated widely but have been somewhat stronger than wheat prices.

The most precipitous price decline occurred in 1930, wheat falling from 158 per cent of the 1922 to 1942 average to 65 per cent and flax from 161 to 72; at

the same time the wholesale price index indicated a decline of only 17 per cent. This trend proceeded to the incredibly low points of 39 and 36 respectively for wheat and flax in 1932. It was at this time that the producers of sugar beets had the greatest comparative advantage as far as prices were concerned both from the standpoint of the actual prices received as well as the stability or dependability of the income.

This dependability of income has been extremely vital to sugar beet growers because the operating costs, particularly that of labour, are relatively higher than for other types of farms and these charges must be met out of the current income. Furthermore the remuneration which beet workers have received has been such that any considerable reduction in their income could not be sustained since these workers had no capital to deplete and little real estate to offer as security for loans. It was therefore, incumbent upon the beet-sugar industry to protect the growers to the greatest possible extent.

Fluctuations in the prices of cattle, hogs, sheep, and lambs spelled disaster in many instances during the early thirties but with the higher livestock prices the feeding of hogs and lambs has become more profitable and an important part of the agriculture of the irrigated areas, particularly in the Eastern Irrigation District. Cattle feeding also has become more profitable especially for those who are located near the sugar beet factories and are able to feed beet pulp.

On the whole, livestock production has enjoyed an advantage over the production of field products (Table 6). This was particularly true of the period covered by the present study, 1939 to 1941, and this fact should be kept in mind when considering the results obtained in this analysis. While a direct comparison of this nature, of the indices of field and animal products is valid only to the extent that the characteristics of the base period are recognized, it is clear that livestock production had a comparative advantage.

FARM TENURE

In classifying farm operators according to tenure of farm the Dominion Agricultural Census uses three main classes, namely: owners, tenants, and part-owners-and-part-tenants. An owner has some nominal and legal ownership claim to all the land which he operates; a tenant operates land over which someone else exercises ownership; while a part-owner-and-part-tenant owns part of the land and rents part of the land which he operates. By this classification the farms studied indicate that in the irrigation areas, at the time of the field survey, 58 per cent were owners, 31 per cent tenants, and 11 per cent were part-owners-and-part-tenants. This distribution of the tenures into these classes was about the same as revealed by the Census of 1936 for southern Alberta; but there were proportionately fewer owners compared with other tenures in these irrigated areas than in the northern part of Alberta.

The proportion of farmers in the three tenure classes varied greatly between districts. In the Taber District approximately 73 per cent were owners, whereas in the Canada Land and Irrigation District only slightly more than 40 per cent were owners. In this latter District there was about the same proportion of renters as of owners.

In some cases the difference between an owner and a renter was largely a matter of the difference in a contract. One had about as much equity in the land he was operating as the other. In the owner instance the farmer had purchased the land usually from the irrigation company under agreement for sale, but had got so far behind in his payments on the real estate as well as water rights and charges, that an additional agreement was entered into. The additional agreement was really a crop lease given to the vendor by the purchaser for a certain share of the crop. The amount of the share above the current water charges, taxes or advances would be credited as payment on interest or

principal outstanding. At the time of the survey several of such contracts were in operation particularly in the United Irrigation District. Since that time in this District, new contracts of agreement for sale based on a revaluation of the land have been issued to the farmers.

In the presentation of the operating statements in this report for the various types of farms all tenures were grouped together. Where a share of the crop went to the landlord (in most instances the irrigation district management) such share was considered as part of the operator's receipts, and the farm business was charged with the landlord's as well as the operator's expenses. The object of combining the tenures for an analysis of the farm operating statements was to show the receipts, expenses, and net returns of the farm as a unit irrespective of how the returns were shared. In the statements of assets and liabilities the tenure classes were kept separate.

LAND USE IN THE IRRIGATED REGIONS OF ALBERTA

Trends in Crop Production.—The evolution of the present agriculture of a region is fairly well described in the history of its crop acreages. This is given for the Canada Land and the Eastern Irrigation Districts in five-year averages from the earliest years of the establishment of irrigation farming in those Districts (Table 7).

TABLE 7.—ACREAGES IN FIVE-YEAR AVERAGES OF MAJOR CROPS

Year	Total Irrigable Acreage under Crop	Wheat	Oats	Barley	Flax	Alfalfa	Number of Farm Units
	acres	acres	acres	acres	acres	acres	
Canada Land and Irrigation District, 1920 to 1942							
1920.....	4,978	1,603	737	71	917	376	30
1921 to 1925.....	10,119	5,053	1,361	691	42	1,276	70
1926 to 1930.....	22,261	14,501	2,000	512	682	1,631	165
1931 to 1935.....	30,839	14,135	3,331	1,205	28	2,987	243
1936 to 1940.....	36,766	20,413	3,205	1,746	1,584	1,864	298
1941 to 1942.....	40,818	11,872	5,804	5,634	4,620	2,098	339
Eastern Irrigation District, 1918 to 1943							
1918 to 1920.....	63,821	31,276	8,684	780	7,531	1,252	521
1921 to 1925.....	93,259	52,584	11,570	4,058	1,667	9,441	991
1926 to 1930*.....	77,387	37,752	9,922	6,391	1,161	15,254	935
1931 to 1935*.....	93,841	34,666	17,212	10,338	1,507	18,984	.....
1936 to 1940.....	123,692	53,992	16,082	9,394	7,516	19,781	.....
1941 to 1943.....	610,689	22,987	23,631	19,301	16,212	25,138	1,500

*No crop census available for 1929 and 1935. Figures are four-year average in these groups.

Both the Canada Land and the Eastern Irrigation Districts were colonization projects; the latter was under way a few years before the Canada Land and contained more acreage under dry land farming in the beginning of its irrigation. At the end of the first five years of any noticeable farming under irrigation there were slightly more than 500 farms (1920) in the Eastern Irrigation District; and at the end of the last three years (1943) there were over 1,500. The corresponding figures for the Canada Land and Irrigation District were (1924) 70 and (1943) 340.

It will be noted that grains are the principal crops grown, with wheat by far the most important. Until recent years in the Canada Land area an increase in the total cultivated acreage was usually accompanied by an increase in the wheat acreage. Even in recent years with a reduced acreage in wheat, there was almost as large an acreage in wheat as any two other crops combined.

Although occupying a smaller proportion of the total cultivated acreage in the Eastern Irrigation District wheat has continued until recent years to occupy first place in total acreage for any single crop. During the past two years there were greater acreages in both oats and alfalfa than in wheat. The combined acreage of oats and barley has almost doubled that of wheat. In a large measure this was due to wheat acreage reduction payments which also brought on other changes in cropping practices.

During the past few years in the Eastern Irrigation area the greatest gain in acreage to be made by any crop was alfalfa. The average acreage in alfalfa exceeded that of any other single crop during the past two years. In 1943 nearly one-sixth of the total irrigable cropland was in alfalfa. Since the present war began there has also been an increased emphasis on the acreage sown to flax. This is evident in the acreage of both the Eastern Irrigation District and the Canada Land.

The development of the Taber Irrigation District and the area known as the Alberta Railway and Irrigation block of which the sub-district Coaldale is covered in this report has differed from the two areas just discussed in that the production of sugar beets has been an important enterprise. It is here that the maximum benefits have been obtained from irrigation and it has been from these two areas that much of the enthusiasm for irrigation farming in Alberta has been derived. The canning factories at Taber and Lethbridge have further added to the market opportunities. Such development is possible only when the markets are established and, generally speaking, the creation of processing plants and other marketing facilities has been rather difficult.

The acreage of sugar beets grown in the Taber area has increased almost eight times since 1925 and the yield per acre has more than doubled within the same period (Table 8). The sugar beet factories at Raymond and Picture Butte provide a readily accessible market for growers in the Lethbridge Northern Irrigation District, the Alberta Railway and Irrigation block, the Raymond and the Magrath Districts, and in the Taber area, while the canneries located in Lethbridge and Taber have made possible a further increase in the intensity of land utilization in these areas.

TABLE 8.—ACREAGE AVERAGED BY PERIODS AND YIELD OF BEETS IN THE TABER DISTRICT, 1925 TO 1942

Year	Acres	Yield per Acre	
		tons	
1925.....	752		6.57
1926 to 1930.....	2,514		8.95
1931 to 1935.....	4,189		11.77
1936 to 1940.....	4,787		14.12
1941 to 1942.....	6,002		14.46

The United Irrigation District has presented a somewhat more confused picture. Beets have been grown only to a limited extent while the production of grains as cash crops under irrigation has not proved to be profitable. There has been, however, a trend in the last few years toward a greater diversification of farming in the District, more emphasis being placed on livestock production.

Utilization of Land in Farms Studied.—For the most part the land-use pattern in the irrigated areas of Alberta is remarkably uniform. Even the farms having the most intensive cultivation had the bulk of the cultivated acreage seeded to cereal crops, most of it being in wheat. This homogeneity might suggest that there would be little value in examining the land use in the

irrigated areas. The purpose becomes clearer, however, when it is considered that this area is still in an early stage of development agriculturally and that this similarity in land use throughout the region may be in large measure explained by the newness of the area. It was, in fact, the comparatively minor variations in the land-use pattern which created considerable interest in irrigation farming in Alberta and which prompted, to some extent at least, an investigation into the future possibilities of irrigation farming.

TABLE 9.—UTILIZATION OF CROPLAND IN FOUR GENERAL AREAS UNDER IRRIGATION IN ALBERTA, 1939-40

Land Use	Canada Land, Bow Slope ¹ and New West	Brooks and Rose- mary ²	United Irriga- tion District	Taber and Coal- dale
	acres	acres	acres	acres
Total acres per farm.....	277	269	201	178
Irrigated cropland.....	146	135	108	91
Dry cropland.....	31	12	36	60
Total cultivated.....	177	147	144	151
Proportion cultivated area in:	%	%	%	%
Wheat.....	53	43	45	43
Oats and Barley.....	14	19	12	7
Flax.....	5	9		
Alfalfa.....	6	8	10	6
Other hay crops.....	2	1	6	1
Peas and Beans.....		6		1
Truck crops.....				2
Sugar beets.....				14
Summerfallow, etc.....	20	14	27	26

¹ Bow Slope is a sub-district within the Eastern Irrigation District in the southwest corner adjacent to the Canada Land block.

² Sub-districts of the Eastern Irrigation District.

In order to arrive at an approximate picture of the land use in the districts studied in detail four general areas were delimited (Table 9). Of the four, the Canada Land-Bow Slope-New West area contains the farms having the largest number of acres per farm as well as the largest number of acres under cultivation. The Brooks-Rosemary area does not differ significantly from the area mentioned in the foregoing in land use, the only difference being that the latter devotes a larger acreage to peas and other more specialized crops. The United Irrigation District is similar in its land use although there is a somewhat stronger tendency to mixed farming. The Taber-Coaldale area, on the other hand, constitutes a significant variation in that sugar beets and other intensive crops occupy a considerable acreage. This probably explains why the irrigated acreage per farm in this area is less than in any other.

Up to the present time the development of irrigation farming in Alberta has been gradual because the use of water demands a type of agriculture of considerable intensity, particularly where costs of irrigation are high. Even in the Taber and other areas where beets are grown, the increase in the acreage of this crop has been gradual. While as a source of income, beets are by far the most important crop in the Taber District, the acreage in this crop was less than one-third of that in wheat. Much of this wheat was grown on the non-irrigated cropland. On the average the Taber Irrigation District farms comprised a larger acreage of dry cropland and the farms of the other irrigation districts.

Livestock.—The number of livestock kept on irrigated farms studied in 1939 to 1941 varied with the type of farming. On the grain farms there were fewer livestock and this applied to all kinds. The averages were 4 horses, 5 head

of all kinds of cattle, and 8 hogs (Table 10). There were a few farms on which there was practically no livestock kept, not even a milch cow, but these were the exception. As would be expected the livestock type of farms carried the largest number and classes of livestock. On an average there were 28 head of cattle per farm. These farms do not include ranch types, which are treated separately in this report. Some livestock was kept on practically every beet farm.

Statistics are not available to trace the increase in livestock numbers under irrigation farming, as has been possible for acres of crops.

TABLE 10.—AVERAGE NUMBERS OF LIVESTOCK BY KINDS AND PROPORTION OF FARMS WITH KIND ON IRRIGATED FARMS IN IRRIGATION DISTRICTS¹
ACCORDING TO TYPE OF FARM AS OF MAY 1, 1940

	Grain	Specialty Farms		Livestock
		Crop	Mixed	
Average Numbers				
Horses.....	4	6	7	8
Cattle: Dairy.....	3	5	4	7
Beef.....	2	4	8	21
Sheep.....	1	1	2	7
Hogs.....	8	18	26	44
Hens.....	69	62	89	64
Percentage of Farms Carrying Livestock				
Horses.....	82	96	92	100
Cattle: Dairy.....	56	95	76	83
Beef.....	38	18	46	52
Sheep.....	12	1	18	35
Hogs.....	74	94	92	100
Hens.....	88	94	94	100

¹ Eastern, Canada Land, New West, and Taber Irrigation Districts.

At an average of possibly 10 head of cattle per farm as indicated by Table 10, the progressive increase in the number of farms in areas such as the Eastern and Canada Land Irrigation Districts would suggest a substantial progressive increase in the numbers of this kind of livestock. During the last 20 years corresponding increases in other kinds of livestock particularly hogs and poultry also, no doubt, took place.

The 1936 Census of the Prairie Provinces gives the numbers and classes of livestock by municipal divisions. From these the density of livestock population can be roughly estimated. Within the boundaries of the Eastern and Canada Land Irrigation Districts, in which, as has been pointed out, a relatively small part of the total acreage is irrigated, there were in 1936 about twice the number of grazing animals, namely horses, cattle, and sheep, as occupy the lands adjacent to these Districts on the east where irrigation is not practised.

DEFINITION OF TERMS USED

Many common words are used to express different meanings. The technical terms in this report are used in accordance with the meaning given them by farm management students.

Cash receipts include receipts from the sale of farm produce, earnings from custom work, and such remuneration to operator as may be considered a part of the farm business.

Farm expenses comprise all cash expenses incurred during the year's business, exclusive of family cash living costs, but inclusive of board of paid labour and an allowance for board and wages of any unpaid family labour.

Unpaid family labour consists of help given by members of the farm family, other than the operator, for which no direct wage was paid. Its value was determined on the basis of the amount of additional labour the operator would have had to hire at current wages had the family labour not been available.

Cash family living expenses comprise all the cash expenditures of the family for the year—groceries, fruit and meat, fuel and lighting, maids hired, clothing, household furnishings, health services, education; church and charity, life insurance, personal expenses, and a share of the telephone and automobile costs not attributable to the farm business.

Farm perquisites include the value of food and fuel grown on the farm and used in the farm household in addition to an allowance for the operator's use of the farm house.

Farm income is the difference between cash receipts and farm expenses, allowance being made for changes in value of inventory and for depreciation on farm capital assets.

Farm surplus or net income represents cash farm receipts less cash farm operating and family living expenses with an allowance made for the depreciation of buildings and machinery, and adjustment made in change of farm inventory.

This term represents the amount left at the conclusion of the year's business which the operator has for purposes of meeting interest payments, retiring debts or for savings. By adding the farm family living costs to the farm expenses an assumption is made that the living expense is remuneration to the operator and his family for their work on the farm.

Operator's labour earnings comprises farm receipts less farm expenses (including a charge for the family labour) and 5 per cent on the average capital value of the business during the year, to which is added farm perquisites. It is the compensation to the operator for his labour and management after allowing a share out of proceeds for capital invested in the business and for labour other than his own.

Intensive farming is a term to describe farming when comparatively large amounts of labour and working capital are used per acre of land and has the opposite meaning of:

Extensive farming where comparatively small amounts of labour and working capital are used per acre of land.

FOUR MAIN TYPES OF FARMS

In the irrigated areas of Alberta there are four main types of farms. These are the grain, the specialty crop (principally beets), the livestock, and the mixed crop-livestock types. The organization of a farm, however, does not always lend itself to a clear cut categorizing into one of these four divisions. There are several farms which might be described as border line types, in that they resemble one type almost as much as another. The segregation of farms covered in this study according to type was done on the proportion of gross returns derived from the separate enterprises. Gross returns included farm products consumed on the farm, and change in inventories as well as cash receipts. The four main divisions according to types included sub-types, which will be referred to again; but for a general description of the irrigated areas in respect to farm types the four classes will suffice.

The grain farms predominate in those districts in which there are no facilities for handling specialty crops. The organization of these farms is only slightly different from grain farms operated under dry land farming conditions. The chief difference is that the farms are somewhat smaller and, under irrigation practices, alfalfa is more commonly grown in the cropping systems. During the year of the survey, on the grain farms of the irrigated area, 78 per cent of the gross returns was obtained from grains, chiefly wheat.

The specialty crop farms predominate in those districts where facilities have been provided for handling these crops. On these farms the returns from specialty crops amounted to about 65 per cent of the gross returns. The average farm of this type contains much less acreage than the grain farm under irrigation. There are varying degrees of specialization; usually the smaller farms are less diversified than are the larger farms. Of the specialty crop farms comprising less than 75 acres of irrigated cropland more than three-quarters of the gross receipts were derived from specialty crops whereas, during the same year on farms of a greater acreage, less than two-thirds of gross receipts came from specialty crops. The other third of the gross receipts from these larger farms was derived from less intensive crops and livestock.

The other two types of farms—the livestock and the mixed—are more commonly distributed than are the two types described above. Under irrigation feed supplies may be assured. Some returns are derived from livestock on practically every farm, but the importance of the enterprises in the farm business varies. In some areas crops are grown primarily in support of the livestock industry while in others such as Taber livestock feeding utilizes the by-products of the beet industry. Farms included in this study which have been described as of the livestock type on an average derived approximately two-thirds of their gross returns from livestock and livestock products.

The mixed crop-livestock type of farm is the most common in the agriculture of the irrigation districts. In these about equal emphasis is placed on the production of crops for sale direct and for feed and to the care of livestock. On the farms described as a mixed crop-livestock type the returns from crops grown for direct sale were somewhat greater than the returns from livestock and livestock products.

The distribution of farms is given by type in Table 11, which also gives the proportion of gross returns obtained from the various important enterprises.

TABLE 11.—DISTRIBUTION PER FARM OF GROSS RETURNS ACCORDING TO FARM TYPE¹

	Predominant Type of Farm			
	Grain	Beets	Livestock	Mixed
	\$	\$	\$	\$
Average gross returns from:				
Grains.....	1,532	701	585	904
Beets.....		2,258	12	2
Other crops.....	86	308	155	135
Livestock and livestock products.....	277	541	1,586	696
Other returns.....	72	78	86	162
	1,967	3,878	2,424	1,899
Proportion of gross returns in:	%	%	%	%
Grain.....	78	18	24	48
Beets and specialty crops.....		64		
Livestock and livestock products.....	14	14	66	37
Number of farms.....	No. 78	No. 139	No. 95	No. 132

¹ Farms in the Rolling Hills district not included.

CHARACTERISTICS OF FARM TYPES

In the previous section, four general types of farms found in the several irrigation districts studied were described. The characteristics of the businesses of these farm types are presented in more detail in this section. For this purpose a further division of the four general type groupings has been made by areas; and a still further division is made in a few of these farm groupings according to size of farms, where there was an adequate number of farms to give a representative sampling in the finer division.

Grain Farms.—As noted, grain farms were more common to the Canada Land and New West Irrigation Districts. To these grain farms, for purposes of analysis, have been added a few similarly organized farms of the Bow Slope area. The Bow Slope area lies north across the Bow River from the Canada Land and New West Districts.

Receipts.—For the 73 grain farms in the Canada Land, New West, and Bow Slope areas, wheat constituted by far the most important source of farm revenue (Table 12). Flax was the second most important cash crop. Other crops sold, consisted chiefly of coarse grains. Legumes were grown but these were disposed of chiefly through livestock. Receipts from the sale of livestock and livestock products averaged about the same as from flax.

TABLE 12.—CURRENT REVENUE OF GRAIN FARMS, CANADA LAND, NEW WEST, AND BOW SLOPE IRRIGATION DISTRICTS, CROP YEAR 1939-40

Source	Number of Acres Irrigated Cropland		
	124 or less acres	125 to 249 acres	250 or more acres
	\$	\$	\$
Wheat sold.....	776	1,497	2,310
Flax sold.....	43	218	129
Other crops sold.....	101	54	242
Livestock and livestock products sold.....	47	210	189
Custom work.....	23	45	100
Sales of equipment.....	36	85	172
Other sources.....	45	23	4
Total receipts.....	1,071	2,132	3,138
Number of farms.....	27	34	12

Current Operating Expenses.—Labour costs constituted the largest single item of expense on these grain farms and it generally took the form of custom labour (Table 13). This consisted of tilling, combining, and other farm operations where the farmer engaged someone with large equipment to help put in and harvest the crop. Only in the case of the largest farms was any considerable amount of 'hired' labour used; the two smaller groups were of the family size, utilizing family labour. Practically no commercial fertilizer was applied on the grain farms.

Farm Capital.—The total capital investment of the owner operated farms of this type ranged, on the average, from \$4,412 for the smallest to \$10,164 for those in the largest group (Table 14). This difference in capital investment is accounted for almost entirely by the differences in size of holdings of land since the investment in livestock and machinery was not proportionately greater on the larger farms. As far as the proportioning of the factors of production is concerned it is obvious that machinery on the largest farms was being employed

much more efficiently than on the smaller farms. The average investment in farm real estate in the three size groups varied from \$2,730 to \$7,343, a difference of \$4,613, while the corresponding difference in machinery investment was only \$535.

TABLE 13.—MAIN ITEMS OF CASH EXPENSE ON GRAIN FARMS, 1939-40

Expenditure	Number of Acres Irrigated Cropland		
	124 or less acres	125 to 249 acres	250 or more acres
	\$	\$	\$
Labour: Hired.....	41	93	232
Custom.....	200	247	396
Contract.....	2	1	34
Irrigation assessment.....	146	290	558
Taxes.....	41	69	118
Tractor.....	73	181	232
Farm automobile.....	6	40	44
Fertilizer.....		2	
Feed and seed.....	47	43	80
Stock pasture.....		3	3
Other.....	107	213	273
Total cash expenses ¹	663	1,182	1,970

¹ Cash living and capital expenses not included.

TABLE 14.—FARM CAPITAL OF GRAIN FARMS, 1939-40¹

Form of Investment	Number of Acres Irrigated Cropland		
	124 or less acres	125 to 249 acres	250 or more acres
	\$	\$	\$
Farm real estate.....	2,730	4,366	7,343
Livestock.....	222	396	572
Machinery.....	1,317	1,350	1,852
Feed, seed, etc.....	143	167	397
Total.....	4,412	6,279	10,164

¹ Owner-operated farms only.

Mixed Crop-Livestock Farms.—Where the proportion of gross receipts was less than 40 per cent from livestock and less than 74 per cent from crops, the farms were classified as 'mixed'. In describing the sources and amounts of receipts, expenses and capital structure of 'mixed' farms, two size groups of farms studied in the Canada Land, New West, and Bow Slope areas are used, and these are treated separately from the mixed farms of the United Irrigation District.

Receipts.—As would be expected, of the total, the receipts from crops were proportionately less and receipts from livestock proportionately more than was the case with the grain farms (Table 15). For farms of similar size in the Canada Land, New West, and Bow Slope areas total receipts were somewhat higher for these mixed farms than they were for the grain farms discussed in the foregoing.

The total receipts of farms of mixed type in the United Irrigation District were less than those for the mixed farms in the other districts of similar acreage.

TABLE 15.—CURRENT REVENUE OF THE MIXED GRAIN-LIVESTOCK FARMS, CANADA LAND, BOW SLOPE, NEW WEST, AND UNITED IRRIGATION DISTRICT, 1939-40

Source	Canada Land, Bow Slope, New West		United Irrigation District
	124 or less acres irrigated	125 or more acres irrigated	
	\$	\$	\$
Wheat sold.....	581	1,038	401
Flax sold.....	47	172	
Alfalfa and clover sold.....	13	34	
Other crops sold.....	105	126	77
Livestock and livestock products sold.....	295	718	431
Custom work.....	118	171	46
Sales of equipment.....	31	161	69
Other sources.....	31	125	64
Total receipts.....	1,221	2,446	1,088
Number of farms.....	43	42	30

Current Operating Expenses.—In the Canada Land, New West, and Bow Slope areas the larger farms (those irrigating 125 acres or more cropland) had an average outlay for hired labour of \$209 (Table 16). Such an expenditure for hired labour implied that these farms employed, in addition to the family labour the equivalent of one man for five months.

TABLE 16.—MAIN ITEMS OF CASH EXPENSE ON MIXED FARMS, 1939-40

Expenditure	Canada Land, Bow Slope, New West		United Irrigation District
	124 or less acres irrigated	125 or more acres irrigated	
	\$	\$	\$
Labour: Hired.....	33	209	1
Custom.....	152	176	86
Contract.....	1	15	4
Irrigation assessment.....	162	314	144
Taxes.....	43	85	71
Tractor costs.....	71	216	56
Farm automobile.....	14	42	35
Fertilizer.....		4	3
Feed and seed.....	50	85	51
Stock pasture.....	3	7	4
Other.....	130	188	116
Total cash expenses ¹	664	1,341	571

¹ Cash living and capital expenses not included.

The mixed farms in the United Irrigation District hired very little labour by the day, month or year. The small expenditure for labour was made almost entirely for custom work indicating that these were family-size farms.

Farm Capital.—The nature of the capital investment on mixed farms was similar to that on the grain farms. Farm real estate represented roughly one-half of the total investment while machinery varied from a quarter to a fifth (Table 17).

TABLE 17.—FARM CAPITAL OF MIXED FARMS, 1939-40¹

Form of Investment	Canada Land, Bow Slope, New West		United Irrigation District
	124 or less acres irrigated	125 or more acres irrigated	
	\$	\$	
Farm real estate.....	2,934	5,766	2,319
Livestock	553	1,067	690
Machinery.....	817	2,031	793
Feed, seed, etc.....	135	332	130
Total.....	4,439	9,196	3,932

¹ Owner-operated farms only.

Livestock Farms.—Those farms receiving 40 per cent or more of their gross receipts from the sale of livestock were classified as 'livestock' farms.

Receipts.—The receipts from livestock were from two to three times greater than were those from crops (Table 18), and in this respect this type differed significantly from the other two types described. Livestock farming was found mainly in the Bow Slope area of the Eastern Irrigation District.

In the United Irrigation District the livestock type was second in importance. Of the farms studied about one-half as many qualified as livestock farms as the number which fell under the heading of mixed farms. Receipts from livestock amounted to an average of \$1,402 per farm, and this was more than three times the receipts from livestock and livestock products on the mixed farms of the United Irrigation District (Tables 15 and 18). Receipts from crops averaged approximately the same for the two types. The livestock farms had more irrigated acres than the mixed farms.

TABLE 18.—CURRENT REVENUE OF THE LIVESTOCK FARMS, CANADA LAND, NEW WEST, BOW SLOPE, AND UNITED IRRIGATION DISTRICT, 1939-40

Source	Canada Land, New West, Bow Slope		United Irrigation District
	124 or less acres irrigated	125 or more acres irrigated	
	\$	\$	
Wheat sold.....	198	404	419
Flax sold.....	35	133	.....
Alfalfa and clover sold.....		85	.....
Other crops sold.....	70	90	94
Livestock and livestock products sold.....	797	1,815	1,402
Custom work.....	40	34	80
Sales of equipment.....	27	59	55
Other sources.....	26	20	105
Total receipts.....	1,192	2,640	2,203
Number of farms.....	28	18	14

Current Operating Expenses.—At the time these records were taken, livestock farms in the United Irrigation District were carrying a heavier tax burden than were farms in the Canada Land, New West, and Bow Slope area (Table 19), doing a comparable business during the year. Feed purchases were heavier also in the United Irrigation District while operators in the other areas hired more labour.

TABLE 19.—MAIN ITEMS OF CASH EXPENSE ON LIVESTOCK FARMS, 1939-40.

Expenditure	Canada Land, New West, Bow Slope		United Irrigation District
	124 or less acres irrigated	125 or more acres irrigated	
	\$	\$	
Labour: Hired.....	1	2	10
Custom.....	122	143	106
Contract.....	47	154	24
Irrigation assessment.....	143	305	187
Taxes.....	36	68	109
Tractor costs.....	31	179	85
Farm automobile.....	15	56	38
Fertilizer.....	1	.....	3
Feed and seed.....	116	171	258
Other.....	145	266	275
Total cash expenses ¹	657	1,344	1,095

¹ Cash living and capital expenses not included.

Farm Capital.—With respect to the capital structure of owner-operated livestock farms in the areas under review, it was found that the average capital investment and distribution of this in the United Irrigation District fell about midway between the two size groups of the other areas (Table 20). Within the United Irrigation District the total capital investment was approximately twice as great on the livestock as on the mixed farms due to larger acreage in the latter group.

TABLE 20.—FARM CAPITAL OF LIVESTOCK FARMS, 1939-40¹

Form of Investment	Canada Land, New West, Bow Slope		United Irrigation District
	124 or less acres irrigated	125 or more acres irrigated	
	\$	\$	
Farm real estate.....	2,059	5,437	4,168
Livestock.....	905	2,719	1,831
Machinery.....	857	2,587	1,312
Feed, seed, etc.....	183	447	267
Total.....	4,004	11,190	7,578

¹ Owner-operated farms only.

Feeder Farms.—An appreciable amount of livestock feeding was done in the Bow Slope area of the Eastern Irrigation District and in the vicinity of Taber. In the former, the ranch livestock were finished on alfalfa and other farm-grown fodder and grain, while in addition to these the by-products of the beet-sugar industry were fed in the Taber District. Although very little feeding was done in the United Irrigation District, it is significant that those farms

classified as "feeders" had the highest gross receipts and net revenue. These three farms were feeding hogs. The grain-hog ratio favoured the feeding of hogs at that time.

In the Eastern Irrigation District range lambs were fattened. Lamb feeding has been popular for a number of years and co-operative livestock associations have been formed and have grown to take care of the needs of the enterprise.¹ Cattle are also fed for fattening but to a less extent than sheep feeding in this District. Cattle are also handled by the co-operative livestock associations.

The average gross farm receipts of fifteen feeders in the Bow Slope area for 1940 amounted to about \$4,000 per farm and expenses were approximately \$1,600. After allowing for changes in inventory and capital maintenance \$871 was left for family living and savings.

Specialty Crop Farms.—The specialty crop farm was defined as one receiving at least 75 per cent of the gross returns from crops of which at least 50 per cent was derived from the sale of specialty crops. The main crop was the sugar beet.

Receipts.—Canning crops including peas, string beans, corn, and some others were grown in the Taber Irrigation District for the cannery at Taber. Practically all of those farmers who grew canning crops also produced sugar beets, but in almost every case the latter was the more important source of revenue. In 1939 the receipts from canning crops ranged from a few dollars to over \$3,000 on one or two farms.

The farms in the vicinity of Taber and Coaldale growing specialty crops were the most successful of those studied in the present investigation. As may be seen from Table 21 there was a relatively high degree of specialization in the production of beets with a smaller proportion of the returns from other sources.

TABLE 21.—CURRENT REVENUE OF SPECIALTY CROP FARMS, TABER AND COALDALE AREAS, 1939 TO 1941

Source	Taber			Coaldale
	74 or less acres irrigated	75 to 124 acres irrigated	125 or more acres irrigated	Average 136 acres irrigated
	\$	\$	\$	\$
Wheat sold.....	355	696	1,273	825
Beets sold.....	1,800	2,701	3,936	1,485
Canning crops sold.....	59	95	72	.....
Dry peas and beans sold.....	27	32	235	74
Other crops sold.....	51	92	72	84
Livestock and livestock products sold.....	221	748	1,541	659
Custom work.....	17	15	58	.95
Sales of equipment.....	106	128	285	208
Other.....	19	30	77	8
Total receipts.....	2,655	4,537	7,549	3,438
Number of farms.....	60	28	26	17

¹ In 1930 "contract" lamb feeding on a co-operative basis was initiated in the Brooks area by a few farmers and ranchers. Lambs were chosen from the ranches and placed in the feedlots of the farmers. The rancher received fall market price on weight of lambs going into feedlots and one-half of gain due to rise in price. The feeder business increased and Brooks Livestock Feeders Association was formed and authorized to borrow money from banks for outright purchase of lambs to be placed with reliable feeders.

In subsequent years other livestock associations have been formed. Cattle were handled as well. There are three livestock feeder associations at Brooks directed from the one office and at Lethbridge there are seven. The Provincial Government guarantees loans to livestock feeder associations incorporated under the act up to a maximum of \$100,000. In late years the volume of business of the livestock feeder associations operating out of Brooks and Lethbridge has run as high as 80,000 lambs and 10,000 head of cattle in a single year.



A

B



C



Plate (1)

- A. A seed cleaning plant and warehouse where seeds of different kinds are handled.
- B. A cannning factory at Lethbridge. Note the pea vineyars in the foreground.
- C. A sugar factory at Picture Butte. In the foreground is a beet field after harvest.

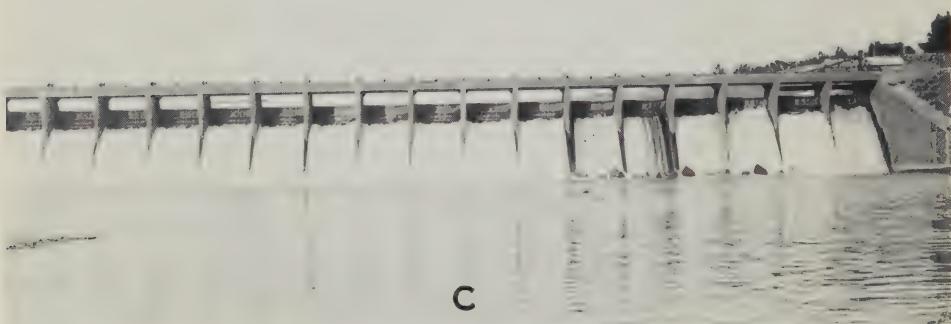
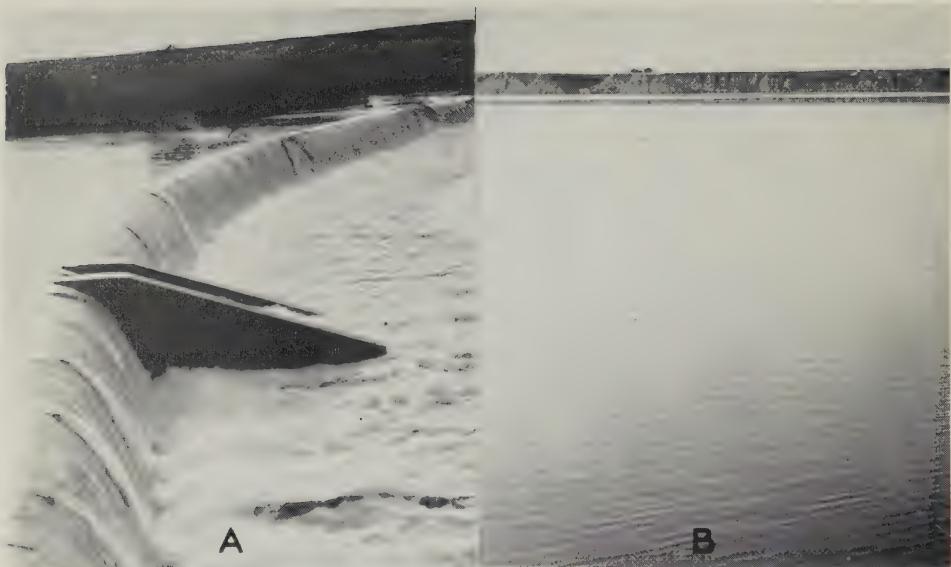


Plate (2)

- A. Dam near headgates. Canada Land and Irrigation Company.
- B. Reservoir, Bassano Dam.
- C. The Bassano Dam.
- D. Gates from lateral canal to field ditches.



Plate (3)

- A. Farm home in the Rolling Hills area two years after irrigation had been provided.
- B. Farmstead of a new settler in the Rolling Hills area just after irrigation had been made possible.
- C. An attractive farm home in the Eastern Irrigation District. In 1937 this land was bare.



A



B



C

Plate (4)

- A. Grain field after harvest. Grain is not profitable under irrigation.
- B. A mixed livestock-grain farm. Note the lateral ditch inside the fence
- C. Cover crop with cattle grazing near Scandia, Eastern Irrigation District

A



B



C



Plate (5)

- A. Lambs from the range being fed on the beet fields after harvest before being put into the feed lots.
- B. Lambs in a winter feed lot on the United Irrigation District. A concrete flume is in the foreground.
- C. A commercial feed lot near Raymond. Beet pulp is hauled directly to the feed troughs from the factory.

A



B



C



Plate (6)

- A. Harvesting vegetables in the Taber Irrigation District.
- B. Loading sugar beets from field rows, Taber Irrigation District.
- C. Unloading beets at shipping point. The truck box is tipped so that the beets roll into a hopper from which they are carried by an endless apron to the pile in the background.

A



B



C



Plate (7)

- A. Sweet clover growing in an unused irrigation district. Beyond is a field of grain.
- B. Oats growing on dry land in Western Irrigation District.
- C. Where water is needed for crop production. Dry land like this may only be used for grazing and the carrying capacity of this land is low. Coal is mined nearby.



Plate (8)

Above—Flood irrigation of hay land.
Below—Irrigating potatoes.

Current Operating Expenses.—In the production of sugar beets the availability of a cheap and reliable labour supply is essential since mechanization of production has not come about to any great extent. The bulk of the labour was hired on a "contract" basis, thereby establishing the wage rate the season. It becomes evident that wages were an important consideration when it is remembered that almost one-half of the current expenditure was for labour. Tractor costs were considerable, particularly on the larger farms in the Taber District. Substantial amounts of commercial fertilizer were used on farms in all groups (Table 22).

TABLE 22.—MAIN ITEMS OF CASH EXPENSE ON SPECIALTY CROP FARMS,
1939 TO 1941

Expenditure	Taber			Coaldale
	74 or less acres irrigated	75 to 124 acres irrigated	125 or more acres irrigated	Average 136 acres irrigated
	\$	\$	\$	\$
Labour: Hired.....	84	233	320	110
Custom.....	105	179	231	63
Contract.....	326	477	895	266
Irrigation assessment.....	104	202	326	111
Taxes.....	44	85	146	79
Tractor costs.....	55	138	262	113
Farm automobile.....	51	70	87	67
Fertilizer.....	52	64	99	40
Feed and seed.....	105	161	280	139
Other.....	210	554	692	528
Total cash expenses ¹	1,136	2,163	3,338	1,530

¹Cash living and capital expenses not included.

Farm Capital.—The capital investment in the specialty crop type of farm is high in comparison with the other types. The group of smallest farms among owner operated farms in the Taber District, those irrigating upwards of 74 acres, had an average of \$6,317 invested in the business, while the group with largest farms had an average of \$20,135 invested (Table 23). Approximately two-thirds of the total capital investment was made up of farm real estate. The average investment in machinery was considerable, ranging from \$1,227 to \$3,744. It may be observed that an average of \$1,763 was invested in livestock on the largest farms in the Taber District. By-products of the beet-sugar factory were available to these farms as a source of cheap feed, which encouraged livestock feeding.

TABLE 23.—FARM CAPITAL OF SPECIALTY CROP FARMS, 1939 TO 1941¹

Form of Investment	Taber			Coaldale
	74 or less acres irrigated	75 to 124 acres irrigated	125 or more acres irrigated	Average 136 acres irrigated
	\$ ●	\$.	\$	\$
Farm real estate.....	4,494	7,099	14,299	7,421
Livestock.....	472	645	1,763	767
Machinery.....	1,227	2,289	3,744	2,072
Feed, seed, etc.....	124	193	329	249
Total ¹	6,317	10,226	20,135	10,509

¹ Owner operated farms only.

Specialty Crop Farms Without Beets.—Within the Eastern Irrigation District near Brooks, Tilley, and Duchess are a number of farms, the type of which might be described as mixed crop-livestock farms producing specialty crops other than canning crops and beets.

Seed cleaning and warehousing plants are located at Brooks and these provide a market for alfalfa, alsike, beans, and pea seed. While receipts from the sale of such crops are a minor part of the farm revenue, nevertheless they are important. In this area, of 15 farms studied, the 1940 crop sales averaged \$2,167 of which nearly \$850 was derived from the specialty crops enumerated. Other revenue of the 15 farms was derived chiefly from livestock and livestock products. This amounted to nearly \$2,000 per farm.

In this same District within recent years there have been a few farmers growing garden crops such as potatoes, melons, citrons, and cucumbers for markets in Calgary and elsewhere.

Mixed Livestock-Grain, and Livestock Types of the Rosemary Area.

The Rosemary area is also in the Eastern Irrigation District and located north and west of the sub-districts previously described. It is a comparatively new area, resettlement of European immigrants having begun about 1928 under the Canadian Pacific Railway Colonization Branch. Following the transfer of the District to the farmers when it became the Eastern Irrigation District more settlers located in the area, coming from the dry land farther to the east. Some of the younger generation of farmers from the older established irrigation projects to the south also arrived at this time, cheaper land in this District being an inducement to leave the older districts. A cheese factory was established at Rosemary by the community in 1940, with financial aid from the Eastern Irrigation District. In the study of this area two general types of farms were noted, namely: mixed livestock-grain and livestock types.

Returns from Farming.—The difference between gross receipts and expenditure after allowing for changes in inventory, and capital maintenance, averaged for the mixed farms \$622 and for the livestock farms \$712. The average size of the mixed farms was 131 acres of irrigated land, that of the livestock farms 90 acres. The total average acreage of the latter class of farms was 272 acres of which 173 were pastured land and 7 acres cultivated dry land.

Growth in Production and Revenue from Livestock.—On most of the farms of both types, milch cows were the source of a substantial part of the farm revenue even before the cheese factory was built at Rosemary. Cream was shipped to the creamery at Bassano. In the spring of 1940 on these farms the number of milch cows averaged 6 head. Two years later in the spring of 1942 for the same farms, the number of milch cows averaged 8.¹ During the same two-year period the average number of young cattle kept on these farms increased from 7 to 10 head. For 1940-41 total receipts from dairy products and cattle sales averaged almost \$400. For the year 1941-42 receipts from the same sources for the same farms averaged approximately \$500.² In the latter year there was an increase in the price of dairy products, and the price of cattle averaged one third higher than in the previous year. It should be noted again that the net results given on farming in the Rosemary area pertained to the year 1940-41.

During the same two-year period (1940 to 1942) the number of sows kept increased from about two and one-half to nearly four per farm. Sales of hogs increased correspondingly. The average number of hogs sold in the year ended April 30, 1941 was about twenty; for the year ended April 30, 1942 the average

¹ and ² Economic surveys of farms producing dairy products for sale, in Alberta conducted by the Economics Division, Marketing Service, Dominion Department of Agriculture in co-operation with the Alberta Department of Agriculture, the Board of Public Utility Commissioners, and the Department of Political Economy of the University of Alberta.

increased to about thirty.¹ For the former period average hog receipts per farm were \$286, for the latter period \$585.² Thus the receipts from hogs over the two-year period were more than doubled. There were three chief reasons for this increase in hog receipts: (1) number sold was increased by 50 per cent; (2) fewer pigs sold as weanlings and consequently more finished; and (3) increases in hog prices.

NET RETURNS OF FARMS BY TYPE AND AREA

General Types.—In an earlier section the average gross return of the irrigation farms for the year under review was given for four general farm types. The type was distinguished by the proportion of the gross returns obtained from a particular enterprise or enterprises, and the characteristics of these types were described. The net returns by farm types are discussed in this section. The net returns are described by two different measures, namely: (1) the operator's labour earnings, and (2) the farm surplus.

The operator's labour earnings for 78 irrigated farms included in the grain types averaged about \$340; it averaged approximately the same for the 132 farms included in the mixed grain-livestock type. For the 95 livestock-type irrigation farms the operator's labour earnings averaged \$616, and for the 139 specialty-crop farms \$1,090. It should be noted that all farms (except those in the Rolling Hills) covered in the study are included here.

"Operator's labour earnings" is the return to the operator for his labour and management, plus a valuation placed on farm produce raised and consumed in the farm home and an allowance for the use of the house. From the net farm income (the difference between receipts and expenditures plus or minus a net change in inventory) has been deducted an interest charge (5 per cent in this study) for the use of capital before arriving at returns to the operator for his labour and management; to this is added value of farm perquisites to the operator to arrive at the operator's labour earnings. This measure is commonly used in farm management analysis and is fairly satisfactory for comparing the results of one farm business with that of another, and at the same time to a limited extent the real income of a farmer compared with that of a wage earner.

In the measure "farm surplus", no interest has been deducted for the use of capital nor is allowance made for the contributions from the farm to the operator and his family in the way of perquisites. From the net farm income is deducted the cash living costs of the operator and his family to give the farm surplus. The money remaining is available for payment on debts, or for savings. It will be recognized that part of these savings may be in the form of increased inventory.

To a certain extent the "operator's surplus or deficit" is more significant to the farmer than is the other measure. An increase in the bank account and decrease in debt have a definite meaning. It also provides a basis for estimating what one could reasonably be expected to pay for land under the conditions applicable to the type of farming being carried on.

For the specialty-crop farms the farm surplus averaged \$654, whereas for the grain farms the "farm surplus" was a negative quantity—a deficit. A deficit of \$90 for those operating grain-type farms means that on an average these farmers failed by \$90 to earn sufficient revenue to meet operating and living costs, and provide for upkeep of buildings and machinery. For one without savings this is possible only through postponing major repairs and cutting down on family living costs, provided he is free of indebtedness. The

¹ and ² Ibid.

man who has debts to pay cannot long afford to accept annual \$90 deficits and remain solvent. From this standpoint the position of the farmers engaged in the specialty-crop type of farming is many times more satisfactory.

For the same year on an average somewhat less remunerative than the specialty-crop type of farming was the livestock type. The average farm surplus earned on these farms amounted to \$122. The result of the year's business of the 132 mixed crop-livestock farms was little better than the grain farms. The average "farm surplus" for these farms was a negative quantity (\$-76). It was noted that approximately 48 per cent of the gross returns of these farms came from grains whereas 36 per cent was derived from livestock and livestock products.

As noted, the mixed crop-livestock farm type was the most commonly distributed type and consequently these farms were located in every irrigation district covered by the economic surveys. With such a high proportion of the gross returns from livestock, one would have expected that the net revenue earned on these mixed crop-livestock farms would have been higher than it actually was. The explanation of this is due to factors other than farm type, including the fact that a number of relatively small businesses fell within this group. A discussion of these will be found in a later section of this report.

Specific Types.—Winter feeding as part of the "ordinary farm organization" was most common on those farms in the Bow Slope and other sub-districts of the Eastern Irrigation District during the years for which data on the farm businesses were assembled. The livestock, principally lambs, were finished on alfalfa and other fodder as well as grass grown on the irrigated areas. This was a fairly profitable outlet for the crops grown.

For 15 farmers of the Bow Slope area who carried a feeder enterprise within the farm organization the labour earnings averaged approximately \$734 and the farm surplus \$161. The farm family cash living costs of these fifteen farmers of the Bow Slope area averaged about \$710.

Relatively low gross receipts in relation to gross expenditures characterized the farm business year of 1939-40 in the United Irrigation District, which resulted in the comparatively low labour earnings for all types. These ranged from a low of \$42 for the grain type farms to \$820 for the livestock feeder types. For the 30 mixed crop-livestock farms, for which particulars on the operating receipts and expenses as well as capital structure have been given in some detail, the labour earnings averaged \$141, and for the 14 livestock farms the labour earnings averaged \$301. The "farm surplus" averages for all types except livestock feeders were negative. The mixed farms on an average failed by nearly \$300 to obtain sufficient revenue to pay all operating costs, family cash living expenses and allow for capital maintenance.

In contrast to the above, livestock farms in the Rosemary area had an average surplus of nearly \$240. On the mixed farms, however, the operators failed by a few dollars of having a surplus. The farmers of the mixed type in the Brooks area, who carried on in addition to the more regular crop-livestock combination, an extra enterprise in the production of seed, obtained an average surplus of about \$200. For the same year the average surplus of the Coaldale farmers who co-operated in this study was nearly \$975. This was obtained from only a little more than one-half the irrigated acreage operated by the Brooks farmers.

As already indicated, almost 45 per cent of the total gross receipts on the Coaldale farms was derived from beets. Even higher than this was the proportion of the gross receipts obtained from beets in the Taber Irrigated District. This amounted to two-thirds on farms with less than 75 acres irrigated, three-fifths with the farms between 75 and 125 acres irrigated, and almost one-half with the farms 125 acres or more irrigated. It is not to be expected that all

irrigation districts can be provided with a market for sugar beets or crops equally remunerative under irrigation farming; but possibly from the results of farming in the several districts studied a fairly profitable combination of enterprises may suggest itself for an irrigation farm removed from such a favoured location to a privileged market as are Coaldale or Taber District farmers.

FINANCIAL SITUATION OF THE MAIN TYPES

Net Worth.—Included in the assets of farmers are small amounts of cash, accounts receivable and other investments in addition to the items of farm capital discussed in earlier sections. Usually, however, the bulk of the farmer's possessions is in his farm, livestock, and equipment. In the net worth statement given in Table 24 are included, for the four main types of farms described, only the owner-operated farms. There was no information obtained on the landlord's assets, other than that visible on the farm, and likewise no information was obtained of the landlord's liabilities, since the operator of the farm was the co-operator in the study.

TABLE 24.—STATEMENT OF AVERAGE NET WORTH OF FARMERS IN REPRESENTATIVE IRRIGATION AREAS¹, BY TYPES, 1940

	Farm Type			
	Grain	Mixed Crop-Livestock	Livestock	Beets
Assets.....	\$ 7,073	7,842	7,569	11,165
Liabilities.....	\$ 4,550	4,151	1,635	3,302
Net Worth.....	\$ 2,523	3,691	5,939	7,863
Percentage Real Estate of Total Assets.....%	63	59	46	63
Number of owner operators.....No.	34	36	23	85

¹ Includes farm owner operators only for Canada Land, New West, and Taber Irrigation Districts and Bow Slope area of the Eastern Irrigation District. See Tables 14, 17, 20 and 23.

While the previous discussion on farm income related to the particular year under review, it is apparent, from average net worth statements, that the same relationship as between net incomes of different types had prevailed for some time. The average net worth of the farmers on beet farms in 1940 at \$7,800 was more than three times that of the average of the grain farmers.

As land usually constitutes by far the largest item of a farmer's assets the statement of net worth can be greatly influenced by the valuation which is placed on land. At the time of the field survey farm operators were asked to place valuations on their land, based on past experience and estimates of future earning capacity. Such valuations are subject to several influences, but the incidence of these tend to be compensated for, when estimates of several farmers are used in group averages. One of the chief influences on the valuation given was the price at which the farmer contracted to pay for his land. In the Eastern Irrigation District the contract prices were reduced following the transfer of the land and irrigation plant from the railway company to the District in 1935. Another important factor which influenced the farmer's appraisal of his own land was the low prices which had been received for some time, for certain farm products, particularly where these were the main source of the farm revenue. This was true of the grain farmer's appraisal of his land, and it was felt that for the farms of the Canada Land Irrigation District a new scale of

values set out by the Company and based on the land ratings and values recommended by the Ewing Commission¹ were more satisfactory. These values were approximately one-third higher than the values put on the land by its operators. These new values were used in calculating the capital of the farm and the assets of its operator. At the time the field survey was made, new land contracts based on this same scale of land ratings and values were being issued to the United Irrigation District settlers, and for this reason in the discussion of assets, liabilities, and net worth by farm types the farms studied in this area are omitted.

The values placed on irrigated land excluding buildings, in the grain, mixed, and livestock farms of the Canada Land, New West, and Bow Slope areas averaged about \$20 per acre. The estimated values on irrigated land on farms in Brooks and Tilley areas averaged about the same. In contrast to these the estimated values of irrigated land in the Taber District averaged \$50 per acre.

The values placed on dry land per acre averaged \$17 in the Taber area, and about \$2 in the Eastern Irrigation and Canada Land areas. The potential use was possibly the biggest factor in estimating the value of dry land. Level areas, which could readily be made irrigable, located within the Districts favourably situated for earning relatively high incomes called for higher valuations. Even the favourably situated rough land, not likely to be made irrigable commanded a higher valuation if adjacent to the higher priced irrigated land.

There was more dry land under cultivation in areas adjacent to that irrigated in the Taber District than adjacent to that irrigated in either of the two Irrigation Districts, with which a comparison on dry land values has been made. The class of dry land adjacent to the Taber District had proved more productive in grain production than had that in the other two areas. Reference to this will be made in a later section of this report.

Farm Indebtedness.—Approximately 69 per cent of the farm indebtedness was accounted for in land debt in the form of mortgages and agreements for sale, chiefly the latter. Machinery, taxes, and water assessments made up the greater part of the remainder of the indebtedness. In subsequent years it appears likely that practically all the latter was paid off and a goodly proportion of that on real estate. A statement on this follows.

On the transfer to the district itself the ownership, management, and operation of the Eastern Irrigation District in 1935 by the Canadian Pacific Railway, new land contracts were issued to the farmers who were still in debt for their land (which included the majority), at a considerable reduction on the original price. A special tabulation of land indebtedness as of December 31, 1937 and subsequent payments made on these was made for four ditch rider areas² representative of somewhat different types of agriculture in four different areas of the Eastern Irrigation District, namely Scandia, Duchess, Tilley, and Rosemary. Of the 230 land contracts in the four ditch rider areas the total land indebtedness as at December 31, 1937 amounted to \$209,396. By December 31, 1943 this land indebtedness had been reduced to \$146,234, a reduction of 30 per cent. This is the same as the estimated average reduction in mortgage and agreements for sale

¹ The Ewing Commission was appointed by the Government of Alberta in 1936, to determine the value of irrigated land on a number of irrigated projects. Following a comprehensive investigation the Commission recommended a scale of values for the land and the water based on soil, topography, nearness to market, and the location of the area in respect to precipitation. Report of a Commission appointed in 1936 to enquire into the various phases of irrigation development in Alberta.

² Ditch rider area.—Irrigation blocks are divided into smaller divisions for the purpose of servicing. These smaller divisions are called ditch rider areas, after the name of the district's employee who turns on and off the water and looks after the maintenance of the main canals and ditches which deliver the water to the farms.

indebtedness on farms in Alberta for the same six-year period.¹ During this period the reduction in mortgage and agreements for sale indebtedness for the three Prairie Provinces is estimated to have been 23·2 per cent.² It is of interest to note that the reduction in indebtedness on land contracts in the ditch rider area sampled in the Scandia district amounted to nearly 40 per cent during the 1938 to 1943 period. This is in the Bow Slope sub-district and Scandia is in the centre of a livestock-type of farming. During the same six-year period the land indebtedness in the Taber Irrigation District was reduced by 60 per cent.³

RANCHES

Among the 550 farmers co-operating in this study were 14 whose businesses resembled more nearly the "ranch" type than a "farm" type. They held grazing leases varying in size from less than a section of land to 30 sections. Their holdings in farm land varied from a quarter section to a section, of which from 40 to 90 per cent was irrigated. While units of this type made up a very small percentage of the farms in the irrigation block, they are nevertheless important. Such units in reality fit well into the economy of the area. Large tracts of grass land less suited to irrigation surround the irrigated farm land and provide summer grazing for livestock, which can be winter fed and finished from the feed produced under irrigation practices. All 14 ranches were located in the Canada Land and Bow Slope areas. Described in terms of the predominant class of livestock, 6 were cattle ranches and 8 of them sheep ranches.

Crops and Livestock.—Acreage in feed crops, principally oats, barley, and alfalfa, in the year of the survey far exceeded the acreage in saleable crops namely wheat and flax on these 14 ranch units. Cattle numbers, chiefly beef cattle, averaged approximately 55 head per unit. For the 6 units which carried mostly cattle, the number of head of cattle averaged approximately 100. On the 8 sheep ranches the number of ewes averaged more than 600 per ranch, and at the time of the survey the number of lambs per ranch was approximately 550. On the 14 ranches an average of 2 sows, 13 other hogs, 13 horses, and 5 colts were kept. Colts were reported on only one-half of the ranches.

Returns, Gross and Net.—The gross returns from livestock amounted to more than three and one-half times the gross returns from all other sources on these 14 ranches. Gross returns were high on practically all ranches. Only for the group of sugar beet farms with more than 125 acres of irrigated land did the gross returns approach the average of the ranches. The averages of the net returns of the ranches measured both in labour earnings and farm surplus, exceeded also the average of net returns of the largest sized group of sugar beet farms. For the year under review farm surplus of the ranches averaged \$1,342 compared with \$1,068 for the largest size group of sugar beet farms.

Receipts and Expenses.—On the 14 ranches the average gross receipts amounted to more than \$6,300 of which more than \$4,900 was made up of receipts from livestock. Receipts from crops averaged slightly more than \$900. Labour was the largest single item of expense and averaged approximately \$1,100 per ranch. Labour employed by the month accounted for the greater proportion of this. On the beet farms for the group of largest size of which comparison has already been made in discussing returns, labour was also the largest single item

¹ Annual Report of the Dominion Mortgage and Investments Association for 1943, March 2, 1944, mimeographed. From a sample study of 25 member companies with 132·8 million dollars invested in prairie farm mortgages and agreements for sale.

² Ibid.

³ Special tabulation by courtesy of the Secretary-Manager, Taber Irrigation District.

of expense. On these beet farms it averaged more than \$1,400; but the greater proportion of this was done under contract. Labour is more regularly employed on the ranches.

Returns and the Financial Situation.—It has been noted that the average farm surplus earned during the year by the 14 ranches amounted to more than \$1,300. As would be expected the average labour earnings for the year were also relatively high. These averaged nearly \$1,700 per ranch.

The amount spent on family living on these 14 ranches is of interest. It averaged approximately \$100 a month and was only exceeded by that spent for cash living by the operators of largest size beet farms. When farm perquisites enjoyed by the operator and his family are added to the actual cash spent on living, the level of living enjoyed by these ranches is indicated to be on an average higher than for most types of farming.

With a surplus on the year's operation as indicated in the foregoing, it would be expected some change would occur in the financial situation of these ranchers. At the end of the year's operation on an average the net worth of these operators was approximately \$1,100 more than at the beginning. Their liabilities were less than 20 per cent of their assets, which averaged about \$17,700 per ranch and were chiefly invested in the ranch business. Nearly 40 per cent of the total ranch capital was in the form of livestock.

The situation both in respect to results of the current year's business and the financial statement presented by using the averages for the records compiled on the 14 farms covered in this survey on the Canada Land and Bow Slope areas is rather an enviable one. However, it must be noted that not all 14 operators of these ranches were in the situation indicated by these averages. On 3 of the 14 ranches the labour earnings were negative. For these ranchers net worth during the year decreased. On 5 of the ranches, labour earnings exceeded \$2,500. Four of these were predominantly sheep ranches and on a fifth more of the gross returns were derived from sheep than from cattle.

Sheep or Cattle.—It may be, that the sheep ranch fits better into the economy afforded by an organized irrigation district surrounded by grazing land than does a cattle ranch, when the district itself is expected to accommodate several hundred farmers. It may be also that under such conditions a 600-ewe ranch allows for a bigger business, a more efficiently operated unit and a greater opportunity to make profits than does a cattle ranch of 100 head of all kinds of cattle. In 1940 the prices received for sheep, lambs, and wool compared with prices for cattle may have been more favourable relative to costs of producing these animals. Or, the explanation for the higher profits on the sheep ranches may be due to the inherent characteristics of the particular ranches studied.

These ranches were considered fairly representative of those within an organized irrigation district. There are several ranches in the southern part of the province where part of the feed is grown under irrigation. These are independent irrigation projects, where the irrigated land surrounded by grazing areas is one and the same ranch unit. These make up a large part of the estimated 68,000 acres of irrigated land operated through individual projects to which reference was made earlier in this report.

An economic study of cattle ranches in Western Canada conducted by the Dominion Economics Division in co-operation with the Dominion Experimental Farms covered as a sampling of ranches for the Short Grass zone 126 ranches¹ in Saskatchewan and Alberta. Of these about 40 per cent had some irrigation—mostly individual projects. On ranches with more than 20 per cent of the cropland irrigated, those outside of organized districts, had an average of

¹ Cattle Ranching in Western Canada, Technical Bulletin 55, Dominion Department of Agriculture.

130 acres of irrigated cropland—approximately one-half that of ranches attached to one of the organized irrigation districts. The irrigated land of the 14 ranches described earlier in this section averaged 225 acres.

Of interest, too, in the comparison of ranches within and without organized irrigation districts are the respective proportions of irrigated land to total area of the ranch—grazing land and crop land. According to the study of cattle ranches, in 1939-40 approximately 2·5 per cent of the total ranch area was irrigated on ranches within organized irrigation districts compared with about one-half of one per cent of the total ranch area for ranches not part of an organized irrigation district.

OFF-TYPE FARMS

For a limited number of farmers there is usually an opportunity to augment the income from the farm by working on neighbouring farms, on public roads, and so forth. In addition to these in irrigated sections, farmers are often given an opportunity of earning income off the farm by cleaning ditches and other extra jobs connected with water delivery. With some farmers outside income is quite a considerable part of their gross income. As noted, these farms were not included in the general study of the relation of farm organization to farm income. The farms not included were those of which the operator's gross returns were made up of 30 per cent or more of receipts from outside sources. Such farms have been referred to in this study as "off-type farms".

In the analysis of the data assembled it was found there were 29 such "off-type farms" in all areas. There were several sources of outside income. For the years under review approximately two-thirds of outside income was derived from custom work done for neighbours, which included seeding, ditching, harvesting, trucking, grinding, and other farm activities. In custom work, part or all the working equipment in addition to the labour, is provided by the person performing the service. For a few persons in the Rolling Hills area, breaking was an important source of outside revenue. For about one-third of the co-operators the principal source of outside income was from labour on irrigation ditches, for carpentering, and so forth. In some instances, it was day labour, while in others it was contract labour. About 40 per cent of these "off-type" farmers were renters which was a greater percentage of this tenure than found in other types.

The farms of these "off-type" operators differ little from those of their neighbours in the same district. They grow crops and raise livestock. For some, the large proportion of outside income was the result of opportunities for that particular year, while for others outside income was a normal expectancy. Of the latter group the acreage of crops was thus smaller and fewer head of livestock were kept.

Gross and Net Returns.—Average gross returns of the 29 off-type farms amounted to approximately \$2,300, of which more than one-third was derived from sources other than sales of crops and livestock. Labour earnings averaged \$576 per farm and surplus for the year's operation averaged \$114. Thus, these off-type farmers, after allowing for depreciation on equipment and buildings, and paying operating and living expenses had a small amount left to meet indebtedness or for savings.

Changes in Net Worth and Financial Situation.—However, according to their net worth statements at the beginning and end of the year the surplus earned was not sufficient to improve the financial position of these farmers. These indicate that the average net worth of the 29 off-type farmers decreased by \$76 during the year. The surplus was not sufficient to meet the interest on

the debt carried. At the end of the year the liabilities averaged nearly \$2,800 per farm and were 52 per cent of these farmer's assets. Approximately one-third of the farm capital was comprised of farm machinery and equipment.

The figures presented are averages, and possibly are as near to typical as can be arrived at. There were a few cases in this "off-type" grouping, which showed a substantial farm surplus during the year. The highest to be obtained was slightly over \$600.

Surplus Compared with Those of Other Farm Types.—During the same time the highest surplus earned by farmers in the other types of farming discussed herein were: ranch type, over \$4,000; beet crop farms, over \$3,000; and grain type farms, \$660.

It is often advisable to employ one's labour and capital on work off the farm provided the farm set-up in itself does not provide for full time profitable employment. The chances are, however, that a farm business which will permit full use of these factors will yield greater returns than one in which outside work must also be sought, for their full employment.

RELATION OF INCOME TO OTHER FACTORS

While the type of farm is the most significant factor affecting the farmer's income in these irrigated districts, there are other factors which are also important. Generally, too, these are to a greater extent within the control of the individual operator. That is, the farmer by himself can exercise more influence on these factors. A few of these will be discussed in the next section.

Effect of Size of Farm on Income.—There are several methods of measuring the size of a farm business.¹ No single measure is entirely suitable for all types of farms. Where the major emphasis of the business is on crop enterprises, "acres of cropland" is the most satisfactory measure. Where the major emphasis is on dairying, the most satisfactory measure is number of cows; on poultry, the number of hens; and so on. For some types such as a mixed grain-livestock and even general livestock, the size of the farm is reflected largely in the number of acres farmed. Under irrigation farming, in the main, the revenue comes from irrigated acres. Irrigated acres appears to be the best measure of size for general application to this study.

Table 25 gives the average farm income, family cash living costs, and net income or surplus for different types of farms described in the previous sections of this report, by size groups. For all types of farms the average net incomes for the larger farms, 125 acres of irrigated land and more, were greater than for the smaller farms.

Usually the larger the farm business, within reasonable limits, the higher the income to the operator. Although there are exceptions to this, this general relationship exists in any region for any type of farming. If the year of the study can be considered a normal one, in a mixed grain-livestock type of farming, for the average individual in irrigation farming in southern Alberta a farm of at least 125 acres of irrigated land is required in order to earn any surplus above operating expenses, capital maintenance, and living costs. A much smaller acreage will suffice if the emphasis in production can be placed on specialty crops such as sugar beets.

¹ The number of productive man work units is the best measure of farm business size where the interests are diversified. A productive man work unit is the average amount of income-producing work accomplished by one man in a ten-hour day. It takes into account the crops and livestock and other income-producing work on the farm. The study of irrigation farming so far has not been comprehensive enough to establish sufficiently satisfactory ratings for the various farm operations to use this measure in the present analysis.

TABLE 25.—RELATION OF INCOME TO SIZE OF FARM BY TYPES

Area	Type	Size Irrigated Acres		Number of Farms in Group	Farm Income	Family Cash Living Costs	Net Income or Surplus
		Range	Average for Group				
		Ac.	Ac.	No.	\$	\$	\$
Canada Land.....	Grain.....	Less than 125.....	94	27	215	373	-158
New West.....		125 and more.....	208	46	627	629	- 2
Bow Slope.....	Mixed Grain-Livestock.....	Less than 125.....	92	43	411	452	- 41
New West.....		125 and more.....	192	42	617	595	22
Bow Slope.....	Livestock.....	Less than 125.....	86	28	467	430	36
New West.....		125 and more.....	181	18	1,009	716	293
Taber.....	Specialty Crops, Beets, etc.....	Less than 75.....	52	60	1,118	773	345
New West.....		75 to 124.....	99	28	1,822	899	923
Bow Slope.....		125 and more.....	164	26	2,530	1,462	1,068

Number of Livestock and Income.—Since 1939 studies in dairy farm management have been carried on by the Dominion Economics Division in co-operation with provincial agencies in representative areas of Alberta, from Edmonton south.¹ Two of the areas studied were Rosemary in the Eastern

TABLE 26.—RELATION OF LABOUR EARNINGS TO NUMBER OF COWS FOR FARMS PRODUCING MILK FOR CHEESE, ROSEMARY AND COALDALE, 1941-42

Range Milch Cows	Average Number of Animal Units of Hogs	Farms Studied	Average Labour Earnings		
				Number	\$
Number	Animal Units	Number	\$		
Less than 5.....	6	15	886		
5 to 7.....	8	21	1,037		
8 to 10.....	8	8	1,267		
11 or more.....	11	6	1,446		

Irrigation District and Coaldale situated within the Alberta Railway and Irrigation District. Information on the dairy farm businesses of these irrigation districts to which reference is made here pertain to 1941-42.

On dairy farms size of business may be measured satisfactorily by the number of milch cows. Table 26 gives the average labour earnings for groups of farms producing milk for cheese factories at Rosemary and Coaldale arranged in order of the number of milch cows per farm. For the year 1941-42 these labour earnings varied from less than \$900 for farms with fewer than 5 cows to over \$1,400 for farms with 11 or more milch cows.

It appears that not all the increased earnings of the farms with the larger number of cows were due to more cows, as these farms also raised more hogs. The combination of more cows and more hogs in each group compared with the preceding one does indicate a larger business and associated with such a business is higher labour earnings.

¹ Economic surveys of farms producing dairy products for sale, in Alberta conducted by the Economics Division, Marketing Service, Dominion Department of Agriculture in co-operation with the Alberta Department of Agriculture, the Board of Public Utility Commissioners, and the Department of Political Economy of the University of Alberta.

The Effect of Yields on Farm Income.—Yields of crops, or of animals—the latter usually referred to as rates of production—are very important and have a direct effect on the farmer's income. This is indicated by the income of 141 grain and mixed grain-livestock types of farms in the Canada Land, New West, and Bow Slope areas. Although the average of the whole group showed a negative income, within the group those farms having a wheat yield of 21 bushels or more per acre returned a positive net income or surplus of \$78; while those farms where the wheat yield was less than 21 bushels gave an average of \$—194. In the group with yields of 21 bushels per acre or over approximately 53 per cent of the farms returned positive net incomes, whereas in the group with yields of less than 21 bushels per acre only 24 per cent returned positive net incomes. For this comparison, farms with wheat acreage on dry land were excluded.

A more striking relationship of the effect of yields on net income is revealed by the beet farms. Only those farms where the sales of beets made up 50 per cent or more of the gross receipts have been used in the tabulation given in Table 27.

TABLE 27.—RELATION OF YIELDS OF BEETS PER ACRE TO FARM INCOME

Tons of Beets per Acre	Number of Farms	Net Income or Surplus
Tons	Number	\$
Less than 12.9.....	19	353
13.0 to 14.9.....	28	489
15.0 to 16.9.....	30	1,020
17.0 and over.....	16	1,118

The average net incomes for the groups of farms with beet yields of 15 tons or more were greater by \$500 than the net incomes of those groups where the yields were less than 15 tons to the acre.

It was noted in Table 8 that the average yield per acre of beets in the Taber District back in 1925 was 6.6 tons, and since then there has been a gradual increase up to 1941 and 1942 when the yield averaged 14.5—more than twice that of the earliest years. This has been accomplished by the application of better fertilizers, better tillage, irrigation, and other improved beet growing practices. While possibly not so striking, increased yields for other crops appear possible with better irrigation farming practices, which for the most part are learned by experience.

Production and Farm Income.—The farms producing milk for cheese factories at Rosemary and Coaldale to which reference has already been made were divided into two groups according to gross livestock returns (livestock and livestock products) per animal unit¹ above and below the average for the two districts. Animal units included all classes of productive livestock. Gross returns per unit depend not only on rates of production, but also on quality and prices received. Confined to the same narrow market, and with a considerable proportion of the livestock products sold to a cheese factory, it is reasonable to conclude that the chief factor in the difference in returns per animal unit was rate of production. It will be noted from Table 28 that those farms with returns per animal unit above average obtained approximately 50 per cent greater labour earnings than did those showing below-average returns.

¹ One animal unit is equivalent to one cow, or three brood sows kept for one year, or five hogs raised to market weight.

TABLE 28.—RELATION OF LABOUR EARNINGS TO GROSS RETURNS PER ANIMAL UNIT FOR FARMS PRODUCING MILK FOR CHEESE, ROSEMARY AND COALDALE, 1940-41

>Returns per Animal Unit	Number of Farms	Average Labour Earnings
	Number	\$
Below average.....	26	890
Above average.....	24	1,282

LABOUR

More labour is required in irrigation farming than in dry land farming, but the extent of this additional labour required depends on the intensity of the type of agriculture practised. In two of the areas described, namely Rosemary and Coaldale, the latter differs more in type from dry land farming on adjacent areas, on account of the production of beets.

Labour Requirements on Two Farm Types Compared.—Table 29 presents the labour used on the farms studied in the Rosemary and the Coaldale areas for the year ended May 31, 1941. This is given by averages for farms with less than 100 acres and for farms with 100 acres or more of irrigated cropland. As previously mentioned, in the Rosemary area the type of farming is a "mixed" one with considerable emphasis on the production of livestock and livestock products. It will be noted that more acres and more livestock were handled per man in the Rosemary area than in the Coaldale area.

TABLE 29.—LABOUR USED ON FARMS ACCORDING TO SIZE, ROSEMARY AND COALDALE, 1940-41

Acres Irrigated Cultivated	Number of Farms	Crop Acres per Man	Livestock Units per Man	Man Equivalent	Months of Hired Labour	Months of Family Labour	Days of Day Labour	Months of Contract Labour
Ac.	Number	Acres	Number	Number	Months	Months	Days	Months

Rosemary

Less than 100.....	12	58	14	1·2	1·3	1·4	5	.....
100 or more.....	10	82	11	1·8	2·0	6·0	12	.....
All farms...	22	71	13	1·5	1·6	3·5	8	.....

Coaldale

Less than 100.....	11	39	8	1·8	.....	4·3	14	3·4
100 or more.....	9	67	8	2·6	0·8	12·0	51	4·8
All farms...	20	54	8	2·2	0·4	7·8	31	4·1

The Coaldale farms used contract labour in the production of beets, but it is apparent that more than contract labour was used in their production. Apart from that hired by contract, more labour was used on the Coaldale farms than on the Rosemary farms. The relative amounts of labour used for farms of

comparable size indicate in some degree the difference in the intensity of agriculture in the two areas. A man equivalent unit is the full employment of one man for twelve months.

Labour Requirements in Irrigation.—In the field survey, in a few of the districts covered estimates were obtained on the amount of time which was spent during the preceding year on irrigation operations. These included levelling, ditching, corrugating, water distribution, and filling the ditches. In the Canada Land Irrigation District where grain, alfalfa and other hay were grown, an average of 46 days per farm or 27 days per 100 acres of irrigated land were spent on irrigation operations.

On the Taber District farms, for the same year there was an average of 38 man days per farm or 40 days per 100 acres of irrigated land spent on irrigation operations. It will be recalled that the Taber farms on an average were considerably smaller than were those of the Canada Land Irrigation District; but a more intensive form of agriculture was practised. The information obtained in the survey does not permit an accurate allocation of time spent in the irrigation of different crops, but by confining the analysis to those farms with comparatively large acreage of specialty crops and a small acreage of other crops, an estimate may be arrived at as to the irrigation labour used for different crops. In 1939 approximately three-quarters of a day per acre was spent on irrigating beet fields, and approximately two-fifths of a day per acre on grain and hay crops irrigated.

It is possible that more time spent in irrigating the grain and hay fields in the Canada Land Irrigation District would have resulted in higher yields, particularly of alfalfa. Over a period of years the beet farmers of Taber have been made more conscious by fieldmen employed by the sugar beet factory company of the importance of irrigating at the right time and with the right quantity of water. The gradual increase in beet yields (Table 8) has resulted from a general application of successful irrigation and fertilizer practices learned by the experience of many farmers in the Taber area.

The distribution of the labour used for irrigating in the Taber area for 1939 by months is as follows:—

April	0·65 days	August	9·05 days
May	1·02 "	September ...	3·75 "
June	12·40 "	October	0·55 "
July	10·30 "	November ...	0·10 "
Total for year.....			37·82 days

FARM POWER

Both horses and tractors are used for field power in the irrigation districts. In 1939 horses were the more common source of field power on the beet farms, and tractors more common on the grain farms. On one-half of the beet farms there were tractors whereas on three-fourths of them there was at least one four-horse unit. On three-quarters of the grain farms there were tractors whereas on only one-half were there at least four horses. Expressed in another way, 42 per cent of the beet farms had no tractors, while on less than 2 per cent were there fewer than two horses. Of the grain farms, about 23 per cent had fewer than two horses; they depended entirely on tractors.

The ratio of tractors to horses used for traction power on the livestock and mixed crop-livestock farms indicated that horses were favoured on the former while on the "mixed" farms tractors appeared to be more commonly used.

On farms of all types horses were more common than tractors on small farms, where as on the large farms tractors were more commonly used. On 30 per cent of the beet farms with less than 75 acres of irrigated land there were tractors, while the corresponding figure on farms of 125 irrigated acres and over was nearly 80 per cent.

It would appear that on irrigated farms horses still have a definite place. There are several operations for which horses are more economical and more practical.

Number of Horses per Farm.—On the Taber beet farms using horses the number averaged 4.0 on farms of less than 75 acres irrigated cropland, 5.5 on farms with 75 to 124 acres irrigated, and 6.0 horses for farms with 125 or more acres irrigated. On many of these farms as noted, particularly the larger ones, there were also tractors. On the Canada Land grain farms using horses the number averaged 3.4 for farms with less than 125 acres irrigated cropland, 4.4 for farms with 125 to 249 acres irrigated, and 5.5 horses per farm for those with 250 or more acres of irrigated cropland. On the livestock and the mixed types of the Canada Land, New West, and Bow Slope areas for those farms with horses, the numbers averaged 5.0 and 4.6 respectively. On many of these farms there were also tractors.

Value and Cost of Operating Tractors.—There were many designs and ages of tractors in operation in the irrigated areas at the time of the survey. The most popular was the medium sized tractor, developing on the draw bar, power for three ploughs.

Over one-third of the tractors in the Canada Land area were more than 10 years old, whereas in the Taber area only about 10 per cent were of this age. In the latter area more than two-thirds of the tractors were less than 3 years old, while in the Canada Land area only slightly more than one-third of the tractors were less than 3 years old. From this it may be deduced that the spread in popularity of tractors as between the two areas described earlier is narrowing.

The value of tractors and cash cost of operating them in the Canada Land and the Taber areas by size groups for the year 1939 are given in Table 30.

TABLE 30.—AVERAGE VALUES AND CASH COSTS OF OPERATING TRACTORS IN TWO IRRIGATED AREAS BY SIZE OF FARMS, 1939

District	Size of Farm Irrigated Acres	Number of Tractors	Value		Cost of Operating
			Acres	Number	
Canada Land (Grain).....	Less than 125.....	17		407	108
	125 to 249.....	29		569	211
	250 and over.....	10		652	279
Taber (Beets).....	Less than 75.....	18		774	185
	75 to 124.....	19		642	204
	125 and over.....	22		842	284

As would be expected the values of the tractors in the Taber area were higher on an average than were those of the Canada Land area.

Tractor operating costs were associated with the acres cultivated. It is probable that on the smaller grain farms the tractors were not used to capacity.

AN EXPERIMENT IN RESETTLEMENT—ROLLING HILLS PROJECT

Introduction.—The Rolling Hills area lies in the southeastern corner of the Eastern Irrigation District and comprises about two townships of land. A low range of hills separates this area from the other irrigable parts of the Eastern Irrigation District. The land surface is quite level, the soil a fine sandy loam to a loam, and in general the whole block is very well suited physically to irrigation. To this level stretch of country, main irrigation canals had been extended in the early years of the development of the Eastern Irrigation District, but on account of the remoteness of the Rolling Hills area from railways further development was retarded, until recent years.

Under an arrangement effected by the Prairie Farm Rehabilitation Administration with the Eastern Irrigation District, development was resumed in the late thirties, and settlement by farmers, chiefly from southern Saskatchewan, took place. This was part of the resettlement program which had as its main objective the re-establishment of farmers who had been victims of a combination of drouth and poor land in parts of southern Saskatchewan and Alberta. In June, 1941, when the field survey for this study was conducted, there were about 104 resident farmers in the area. Two years earlier there were less than 5, and a year later there were 140 resident farmers.

The Economic Survey.—The Rolling Hills area was included in the economic survey of irrigation farming to study (1) the problems confronting new settlers in establishing themselves in irrigation farming, (2) financial rewards which attended the settlers' efforts during their first year of settlement in the area, and (3) to record the financial position of the settler in the first stage of settlement in the area in order that in future years an appraisal can be made of success of the project from the standpoint of the individual as well as the state. To this end a number of the settlers who had been farming in the area for at least one full year were visited and their experiences recorded.

In all, statements from 42 settlers were obtained. The information from 5 of these indicated that a considerable proportion of the year's income was earned by trucking, and since revenue of this nature is not common for the whole these 5 statements have been excluded in a general presentation of farming and its results in 1940-41 within the Rolling Hills area.

Acquisition of the Land.—The land was acquired by the settlers of the Rolling Hills area from the Eastern Irrigation District under a lease agreement with the option of purchasing by contract at the end of two years. A small rental fee was charged the settler amounting to \$10 per quarter section and a water charge based on one-half the regular rate for irrigable land was also levied against him. Where a school district was formed the settler was required to pay school taxes.

At the end of two years a purchase agreement was to be offered the settler. This agreement called for one-fifth of the value of the land in cash and the balance spread over 12 years with interest at 5 per cent. The payments on principal during each of the first four years amount to one-half the payments for each of the last eight years.

In midsummer of 1941, at the time of the survey, all land held by the co-operators in this study was still held under lease. A year later contracts to purchase holdings had been issued to approximately 50 per cent of these people.

Size of Farm.—The most frequent size of holding was the quarter section. The average size of the 37 farms described herein was 177 acres of which 130 acres were irrigated cropland and 5 acres dry cropland. This, together with acreages under crop in 1940, is indicated in Table 31.

TABLE 31.—AVERAGE SIZE OF FARM, AMOUNT IRRIGATED, AND CROPS GROWN IN 1940 FOR FARMS COVERED IN SURVEY OF THE ROLLING HILLS AREA, 1940

Land Use	Farms with Item	Average Acreage per Farm	Percentage of Total Area
	Number	Acres	%
Total Area.....	37	177	100
Irrigated.....	37	130	73
Dry Cropland.....		5	3
Flax.....	35	63	36
Wheat.....	33	39	22
Oats.....	34	16	9
Barley.....	14	4	2
Brome and Sweet Clover.....	6	1	1
Alfalfa.....	6	1	1
Breaking new.....	18	11	6

Utilization of Land.—*Crops.*—Of interest is the relatively high acreage in flax compared with wheat. Of the 37 co-operating farmers 35 grew flax and 33 grew wheat in 1940. In the following year, 1941, fewer farmers grew flax than wheat and acreage of wheat per farm exceeded that of flax. It has been a common practice in some areas on the prairies to grow flax on land broken the same year. The acreages in coarse grains increased from 1940 to 1941 as well as did that sown to alfalfa. Forty per cent of the farmers sowed alfalfa either in 1940 or in 1941, and the acreages sown varied from 3 to 30 acres. Most of it was sown with a nurse crop.

The greater part of the cropped land was broken out during 1939. In 1940 additional land was broken on about one-half of the farms included in the study, but this averaged only about 11·0 acres per farm. A considerable acreage was broken out in the area in 1940, on farms of newly arrived settlers, from whom statements were not obtained.

During 1938 the Eastern Irrigation District broke 100 acres on each of 22 quarter sections. This was charged to the settler at the rate of \$2.50 per acre. After 1938 the Prairie Farm Rehabilitation advanced funds for, and directed the breaking. Settlers were hired to do the work and paid \$2.50 per acre. The advance for breaking was made subject to repayment.

In 1940 the average yield of wheat on the farms included in this study amounted to 21·0 bushels and of flax approximately 8·5 bushels per acre.

Livestock.—The livestock kept in the area appeared to be only sufficient to take care of the needs of the settlement. Most of the livestock had been brought in by the settlers. The horse inventory averaged about 6 to a farm. Only 40 per cent of the farms depended on horses for field power. Cows were kept both for milk and beef. There were a few sheep in the area but these were found on only 4 farms. Hogs were the only livestock which increased in numbers during the year. In part, this was, no doubt, due to the relatively higher prices which prevailed for hogs compared with many other farm products. To some extent too, hogs fitted well into the economy of these farms. The farms were small and all the labour available could not be profitably employed in growing grain for sale. Pasture was limited for cattle but adequate feed supplies could be procured for hogs.

Inventories of farm livestock sales and purchases by type of farm are given in Table 32.

TABLE 32.—KINDS AND AVERAGE NUMBERS PER FARM OF LIVESTOCK ON HAND AT BEGINNING AND END OF YEAR, PURCHASES AND SALES BY FARM TYPES, ROLLING HILLS AREA, 1940-41

—	Mixed Crop-Livestock Type				Grain Type			
	Beginning Year	End Year	Purchases	Sales	Beginning Year	End Year	Purchases	Sales
	Number	Number	Number	Number	Number	Number	Number	Number
Horses.....	7.0	7.0	0.2	0.2	5.0	4.4	0.3	0.7
Colts.....	1.4	1.6	.....	.....	0.4	.....	.....	.....
Dairy cows.....	2.0	2.0	0.1	0.2	1.0	1.0	0.1	.....
Other dairy cattle	2.0	2.0	.....	0.5	0.5	0.7	.....	0.1
Beef cows.....	2.0	2.0	.....	0.2	0.5	0.5	.....	.....
Other beef cattle..	2.0	2.3	.....	1.0	0.6	0.6	.....	0.2
Brood sows.....	1.0	2.4	0.2	0.2	0.2	1.0	0.5	.....
Other hogs.....	5.2	11.1	2.0	5.5	0.4	6.0	1.5	1.8
Sheep.....	1.0	3.0	1.0	0.3	0.2	.....	.....	0.2
Number of farms..			15				22	

Gross Returns.—For a general analysis of the farm businesses for the year 1940-41 as elsewhere in this study of irrigation farming, the farms in the Rolling Hills area were divided into groups according to types. Two types were distinguished, namely: (1) the grain farms and (2) the mixed crop-livestock farms. In organization the latter differed from the grain type in that there was more livestock kept on such farms and consequently greater returns from this source occurred. The gross returns per farm from crops was about the same on both types of farms amounting to approximately \$1,000.¹ On the mixed crop-livestock farms however, livestock returns averaged about one-half of the crop returns whereas on the grain farms the livestock returns were less than one-fifth of the returns from crops. Returns from sources other than crops and livestock were also greater on the mixed crop-livestock farms.

As would be expected from the foregoing, for the farm business year 1940-41 net returns were greater on the mixed crop-livestock farms. The average operator's labour earnings for the 15 of such type farms amounted to \$497 while the same earnings for the 22 grain farms averaged only \$157.

Sources of Receipts.—The chief sources, and the average amounts, of cash receipts of the farms studied in the Rolling Hills area for the year 1940-41 by farms according to type are given in Table 33.

During the first full year of farming activity of the settlers in this area flaxseed made up a considerable part of the farm cash receipts. The average price received for this crop at the farm was \$1.10 per bushel, and the gross cash receipts per acre averaged approximately \$8.50. The average price received for wheat at the same time in the same area amounted to \$0.51 per bushel, and the gross cash receipts per acre averaged approximately \$8.75. As pointed out in an earlier section in the following year wheat acreage exceeded that of flax.

Some attempt was made to grow and sell crops more particularly adapted to irrigation farming than are wheat and flax, but the cash receipts from these sources during this first year were very small.

While the sale of livestock and livestock products made up a considerable proportion of the difference in the total cash receipts as between the two types of farms, cash receipts from custom work and other sources were also greater on the mixed farms.

¹ Gross returns include change in inventory and products raised and consumed on the farm in addition to the cash sales.

TABLE 33.—CHIEF SOURCES OF CASH RECEIPTS AND AVERAGE AMOUNTS PER FARM, BY FARM TYPES, ROLLING HILLS AREA, 1940-41

	Grain Type	Mixed Crop-Livestock Type
	\$	\$
Wheat.....	357	319
Flax.....	527	543
Dry peas and beans.....	5	.....
Other crops.....	48	51
Total crops.....	937	913
Livestock and livestock products.....	88	197
Custom work.....	24	125
Other sources.....	44	78
Total cash receipts.....	1,093	1,313
Number of farms.....	22	15

Farm Expenditures.—The largest single item of current year's expenses for the year under review was for labour (Table 34) and this was chiefly for custom labour. This includes labour done by the piece or the day where the employee provides the equipment, that is, threshing, combining, or tillage operations such as ploughing, cultivating, and so on. This item is relatively higher for small farms and indicates that it was the rule rather than the exception for a goodly part of the farming to have been done by a comparatively few large outfits better equipped to handle the job than was the operator himself. This was to be expected in an area so recently settled.

TABLE 34.—CURRENT AND CAPITAL EXPENSES EXCLUDING DEPRECIATION PER FARM BY FARM TYPES, ROLLING HILLS AREA, 1940-41

	Grain Type	Mixed Crop-Livestock Type
<i>Current</i>		
Cash:		
Labour: Hired.....	\$ 57	\$ 121
Custom.....	272	211
Contract.....	21	...
Board of paid labour.....	23	22
Water rent and lease rental.....	181	203
Real estate expense.....	10	53
Tractor operation.....	66	106
Automobile.....	7	9
Feed, seed, etc.	58	54
Other.....	109	124
Total current cash expenses.....	\$ 804	\$ 903
Non-cash:		
Board of unpaid labour.....	33	15
Unpaid labour.....	142	84
Total current cash and non-cash.....	\$ 979	\$ 1,002
<i>Capital</i>		
New buildings.....	49	101
New equipment (less sales of old equipment).....	205	197
Livestock purchases.....	35	29
Other.....	24	48
Total capital.....	\$ 313	\$ 375
<i>Total Current and Capital.....</i>	<i>1,292</i>	<i>1,377</i>

The next largest item of expense was for water and lease rental. During the first year the farmers were required to pay one-half the water rate based on irrigable acreage. After the first year, they were required to pay the full rate on the actual cultivated irrigable acreage until going into contract, which has generally been after the third year. This item also includes the \$10 rent.

The cost of operating tractors was an important item. The costs given here are average for the 37 farms, of which nineteen had tractors.

Family labour was of significance on these farms in 1940. This item is included in the total operating expenses. It is listed here as a non-cash item.

In capital expenditures, the amount spent on new equipment far exceeded the total of all other items. On new buildings the average expense was less than one-half of that spent on new equipment. While the peak of building activity for these farmers had occurred just previous to the year of the survey, considerable building was done during 1940-41. A good deal of the material which went into the construction of farm buildings in the Rolling Hills area was brought in with the settlers' effects. It consisted of material salvaged from the farmstead which they had vacated. Much of the carpenter work was done by the operator himself or by his co-operating neighbour. Hence a dollar went much further in the erection of new buildings than in the buying of new equipment.

Net Farm Income and Operator's Labour Earnings.—With an adjustment for inventory made, the difference between receipts and expenses gives the net farm income. There were net increases in inventory on both groups of farms. These were accounted for chiefly in such items as livestock, equipment, and new buildings. Such increases are to be expected in any new and growing business. Average net farm incomes for the two types of farming are given in Table 35 which also gives the average operator's labour earnings.

TABLE 35.—NET FARM INCOME, OPERATOR'S LABOUR INCOME, AND EARNINGS PER FARM BY FARM TYPES, ROLLING HILLS AREA, 1940-41

	Grain Type	Type Crop-Livestock Mixed
Cash receipts	\$1,094	\$1,314
Increase in inventory.....	295	393
Total receipts.....	\$1,389	\$1,707
Expenses, current and capital.....	1,292	1,377
Net farm income.....	\$ 97	\$ 330
Interest on capital at 5 per cent.....	78	110
Labour income.....	\$ 19	\$ 220
Farm perquisites.....	133	277
Labour earnings.....	\$ 157	\$ 497
Number of farms.....	22	15

It will be noted from the table that farm perquisites are higher on the mixed crop-livestock farms than on grain types. The probable explanation for this is that where there are more cows there are more dairy products consumed in the farm household, and where there are more meat animals there is more meat consumed in the farm household. The families were larger on the mixed crop-livestock farms than on the grain farms and this may not only account for more dairy products and meats having been consumed in the farm home but may also be the reason more cattle and hogs were kept on these farms. The same is true of garden produce.

Farm Surplus.—As defined elsewhere in this report ‘farm surplus’ is the amount of money available for paying debts or for savings after paying all operating and living expenses and making provision for upkeep of capital. To the net farm income is added the value of unpaid (family) labour and board, and from the total is deducted the cash spent on living costs by the farm family (Table 36).

TABLE 36.—SURPLUS ABOVE FARM OPERATING AND LIVING COSTS AND FINANCIAL RESULTS OF YEAR'S BUSINESS ACCORDING TO FARM TYPES, ROLLING HILLS AREA, FOR YEAR ENDING MAY 1, 1941.

	Grain Type	Type Crop-Livestock Mixed
Net farm income.....	\$ 97	\$ 330
Wages allowed unpaid labour.....	142	84
Board of unpaid labour.....	33	15
Total.	\$ 272	\$ 429
Family cash living costs.....	392	472
Farm surplus.....	—120	—47
Assets beginning of year.....	\$1,752	\$2,357
Liabilities beginning of year.....	480	820
Net worth beginning of year.....	\$1,272	\$1,537
Assets end of year.....	1,958	2,663
Liabilities end of year.....	723	1,128
Net worth end of year.....	\$1,235	\$1,535
Loss in net worth for year.....	37	2

For both types of farms the “surpluses” were negative quantities. This means that on an average for all farms there would be no money left for paying debts or for savings provided sufficient allowance was made for upkeep of capital and all expenses both operating and living were met out of the proceeds of the farm business. Compared with other districts in the irrigation area for the same years, the cash living costs in the Rolling Hills area were low, but there was insufficient net farm income to meet them. Cash living costs exceeding the net farm income may be possible through contributions to the farm family from sources other than the farm and accounted for in the statements presented. The net farm income, too, is arrived at after deduction of an amount for depreciation in farm equipment and buildings for the year, which in many cases is not expended during the year.

Change in Financial Position During the Year.—In Table 36 are also presented the assets and liabilities and net worth statements for the beginning and end of the farm business year 1940-41 by farm types. Net worth is simply the difference between assets and liabilities at any one time. There was no significant change in the average net financial position.

Farm Capital.—The greater part of the assets described in the foregoing were in the form of livestock and farm equipment. In the existing stage of the lease agreement the buildings might be considered as part of the farm equipment. The land was owned by the Eastern Irrigation District. The distribution of the farm capital according to type is given in Table 37.

TABLE 37.—OPERATOR'S AVERAGE FARM CAPITAL ACCORDING TO TYPE OF FARM, ROLLING HILLS AREA, 1940-41

	Grain Type	Mixed Crop-Livestock Type
Real estate (buildings).....	\$ 352	\$ 390
Livestock.....	392	807
Farm machinery.....	621	841
Seed and miscellaneous.....	192	167
Total operator's farm capital.....	\$1,557	\$2,205

Assets and Liabilities Appraised.—The increase in assets which occurred during the year for operators in both types of farms was due to increases in inventories of livestock, machinery, and equipment, and to a lesser extent to additions and improvements made to the farm buildings. More than one-third of the average increase in liabilities which occurred during the year was due to purchases of new machinery. The other two chief items of debt incurred during the year were for supplies from stores and for hired farm work still unpaid.

Liabilities averaged about 40 per cent of assets. While this may appear high enough in view of the fact that the operators at the time this statement was made, had not assumed contractual obligation for purchasing the land which they operated, it is not excessive. In any new and growing area a reasonable amount of indebtedness does not indicate an unhealthy situation.

The statement which these operators were able to present in 1941 is in striking contrast to a statement which they would probably have presented a few years earlier on the farm from which they migrated. For these particular farmers, information concerning the debt situation before they gave up their holdings to move to the Rolling Hills area is not available.¹ However, assuming their situation then in southern Saskatchewan to be similar to others on a like class of land in the mid drouth and depression period (1935) their indebtedness probably averaged nearly \$7,000 per farm operator or \$2,200 per quarter section of land farmed. About 20 per cent of this was for relief and agricultural assistance; 55 per cent was connected with real estate; 7 per cent was for taxes owing; and, the rest on various other accounts such as machinery, gasoline, lumber, and bank. With the most disastrous year of all yet to follow, namely 1937, it is safe to conclude that an equivalent amount to that owing in 1935 as described above for relief, on real estate, and for taxes was written off on the departure of the settler to his new situation in the irrigation areas.

It was this burden of indebtedness coupled with inferior soil for farming under dry farming conditions that induced these farmers to leave the land on which they had toiled for more than two decades and attempt irrigation farming in this Rolling Hills area. It is the result of their first full year of farming operations which has been described above.

In contrast to the previous few years' experience in dry land farming, their first year's efforts have been attended with a fair degree of success. A promise of greater success appears likely when they have acquired more experience in raising crops under irrigation practices.

From a careful appraisal of their situation, however, it is obvious that the introduction of better irrigation practices, alone, can be expected to bring little more net farm revenue than is required to raise the level of living to the plane

¹ "Physical and Economic Factors Related to Land Use Classification in Southwest Central Saskatchewan", pages 26, 47 and 48, Technical Bulletin Number 15, Dominion Department of Agriculture, Ottawa, 1938.

enjoyed by others in the longer established irrigation districts. To obtain a "farm surplus" which will permit the majority of settlers to make headway in meeting payments on a land debt which they are about to assume there will have to be either a change to a more intensive type of crop farming such as characterizes the Taber and Coaldale areas, or in following the mixed crop-livestock type as now exists in the Rolling Hills area, the adoption of a more favourable balance together with higher crop yields and livestock production. For a few there may be opportunities to earn more income from winter feeding of cattle and sheep from the summer ranges nearby. Any pronounced increase in the numbers of stock and the amount of feeding done is likely to require a greater acreage than is now held, and such expansion while desirable from the standpoint of the individual may not be from the standpoint of the settlement. More intensive crop farming will permit room for all and possibly others, but this means the introduction of specialized crops and processing plants to handle these products. A combination of the two types, specialized crops and livestock feeding, would appear to be the ideal to work for in the interests of the individual as well as the settlement.

AN APPRAISAL—IRRIGATED AND DRY LAND

From the figures presented in the foregoing section of this report, it is obvious that any attempt to evaluate the difference in productivity and unit income of irrigated farming areas and dry land areas must take cognizance of the location of these areas in respect to kind of markets available. Characteristics of the land and also the climate, particularly the latter, are also important considerations.

Farm Businesses Summarized.—*The Eastern Irrigation District.*—Of the organized irrigation districts in Alberta, the Eastern Irrigation District is the farthest east, and hence is subject to more arid conditions than other existing organized districts. As pointed out, it is made up of a number of sub-districts some distances apart, the distances being determined by the contour of the land and consequent ease of getting the water onto it. Four of these sub-districts have been described, namely: Rosemary, Brooks, Bow Slope, and Rolling Hills. The climate varies little from one sub-district to another and the soil is remarkably uniform. Interspersed within the Eastern Irrigation District between its sub-districts, and surrounding the area is dry land of which at the present time little is under cultivation. Without water, it is not suitable for arable agriculture. There has been the odd year when good yields of grain were obtained in dry farming in the general area but so few have these years been that whereas a goodly portion of the land to the north, east, and that immediately adjoining to the west, which had been made available for settlement, was at one time occupied and farmed, it has long since been abandoned for arable agriculture and left as range land for the rancher.¹ If carefully husbanded this dry land will support in grazing the equivalent of four to five head of cattle per quarter section for a seven-months' season.² If watering facilities can be provided and provision made for winter feed, a township of such land could

¹ Stewart, A., and W. D. Porter, "Land Use Classification in the Special Areas of Alberta", Technical Bulletin Number 39, Dominion Department of Agriculture, Ottawa, 1942.

² The carrying capacity of the short-grass prairie areas investigated by the Division of Forage Crops of the Dominion Experimental Station, Swift Current, is estimated to vary from 3.6 to 8.0 acres per cow month with an average of 4.7. For a grazing period of seven months this is equivalent to 4 to 5 head of cattle per quarter section. See, S. E. Clarke, J. A. Campbell, and J. B. Campbell, "An Ecological and Grazing Capacity Study of the Native Grass Pastures in Southern Alberta, Saskatchewan and Manitoba", Technical Bulletin Number 44, Dominion Department of Agriculture, Ottawa, 1942. It is considered that the area under review is similar to those where investigations have been made.

probably support three or four families.¹ A township of identical land irrigated could support at least sixty families.²

The average size of the farms included in the economic survey of the Rosemary area was 247 acres of which 116 were cropped. All except a few acres of this cropland was irrigated. From their gross income the farmers in this district in 1940 were able to pay all current operating expenses, provide for the maintenance of farm capital, for the farm family living, and in addition some surplus for meeting indebtedness or for savings. The chief source of receipts were grain, livestock and livestock products. Where livestock and livestock products constituted the largest proportion of the total receipts, the surplus earned was much greater than where these products made up a smaller proportion. Of considerable importance to the economy of the district is the cheese factory at Rosemary.

Although the gross returns of the farmers co-operating in the economic study of irrigation farming in the Brooks area were considerably higher than at Rosemary, the net return averaged about the same. That is the surplus above current operating, living, and capital maintenance costs approximately equalled that obtained by Rosemary farms. However, the average amount spent on living was much higher in the Brooks area than at Rosemary. Of the gross returns of the Brooks farmers, three-fifths was derived from cash crops; a considerable portion of these was made up of dry peas, forage crop seed and other seeds, for which a market had been developed at Brooks. The balance of the returns, in the main, came from livestock of which the returns from feeders made up the greater part.

While feeder stock, principally lambs, was brought in from southwestern Saskatchewan, part of the supply was obtained from ranchers whose flocks had been ranged on the dry land adjacent to the irrigation districts. Much of this dry land is non-irrigable on account of the topography. In providing summer range for feeder stock the dry land adjacent supports a complementary enterprise to the irrigation farm. The irrigated land makes possible holding the stock within the area until it is in a finished state, thus permitting the area to profit by not only the raising but also the finishing of the animals.

"Feeder livestock" enterprises are more common to the farms in the Bow Slope area. This irrigation sub-district is situated in the southern part of the Eastern Irrigation District. For the year under review the surplus of the Bow Slope feeders averaged approximately \$160. Their cash living costs averaged over \$700 per farm family—not as high as with the irrigation farmers in the Brooks area but considerably higher than the living costs of the Rosemary farmers. The total acres operated by these farmer feeders of Bow Slope averaged 260 of which 151 were irrigated cropland. There was in addition 26 acres of dry cropland. Of the irrigated cropland in 1940, 43 per cent was in coarse grains, 24 per cent in wheat, and 14 per cent in alfalfa. Acreage in sweet clover and grasses amounted to about one-half that in alfalfa.

A few of the farmers in this area raise their own feeder stock, having grazing leases on the dry land adjacent to the irrigated parts. As already noted, this latter group have been described as ranchers and were not included for study with the group described as "Bow Slope Feeders". These few irrigation farmers who held grazing leases, were in the most favoured situation for earning income. They were able to profit not only by the growing of the livestock, but also in the finishing of it. The average surplus of these irrigation-farmer-ranchers who were included in the survey amounted to more than \$1,300. With

¹ It is estimated that to adequately support a family, a ranch in size the equivalent of 170 to 200 head of cattle is required. See C. W. Vrooman, G. D. Chattaway and A. Stewart, "Cattle Ranching in Western Canada", Technical Bulletin 55, Dominion Department of Agriculture, Ottawa, 1946.

² According to the 1936 census of population there were a number of townships in the irrigated areas of Alberta where the population exceeded 300. With an average of 5 persons per family, the number of families in these townships would exceed 60.

the exception of a few grain farms, these farm-ranch units were larger than the other farms studied; they averaged 225 acres of irrigated land.

The Canada Land and Irrigation District and Others of Related Farm Types.—The grain type farms as a whole failed by \$59 per farm to obtain sufficient revenue to meet current operating, family living costs, and an allowance for maintenance of capital. This type of farm was commonly found in the Bow Slope, Canada Land, and New West Irrigation Districts. The last two are located south of the Eastern Irrigation District. The climate and soil conditions are quite similar to those of the Eastern Irrigation District.

Wheat provided more than two-thirds of the gross receipts of these grain-type irrigated farms. This was obtained from 53 per cent of the cultivated acreage. On an average in the other districts concerned in this study, about 43 per cent of the cultivated acreage was in wheat. It was not because they grew wheat that the grain farmers on irrigated land failed to meet costs; it was because they produced less of other products which were more profitable under their conditions of farming.

The Taber and Coaldale Irrigation Districts.—Farther south, in the Taber Irrigation District, where a more intensive type of agriculture is carried on, during the year 1939-40 the net incomes were relatively high. These ranged from an average of over \$300 per farm for the farms with the smallest acreage to over \$1,000 for the farms with the largest. Level of living, too, was correspondingly high as measured by the money spent on family living. For the Taber farms this averaged approximately \$850 compared with about \$550 for the grain farmers in the irrigation districts north of Taber. Except that on the whole the texture of the soil is slightly lighter, the natural conditions at Taber are very much like those of the Eastern Irrigation and surrounding districts. However, there are markets for intensive crops in the Taber District made possible by a canning factory at Taber and access to the sugar beet factories at Raymond and Picture Butte. The experiences of the farmers in the Coaldale area were similar to those of the Taber farmers.

From the standpoint of intensity of use, in marked contrast to the irrigated land of the Taber area is the dry land surrounding it. More of this dry land is being cultivated, however, than that adjacent to the Eastern Irrigation District. The soil is generally more suitable for crop production, but from the standpoint of climate for dry land farming there is little difference between the Eastern Irrigation District and the Taber areas. Directly south of the irrigated land in the Taber District a fairly high proportion of the dry land is being cultivated. For the most part these are additional holdings of irrigation farmers who carry on dry as well as irrigation farming. To the north and to the east of the irrigated land, cultivated parcels are more frequently interspersed with uncultivated ones, some of which have been broken out, subsequently abandoned for cultivation, and are now covered with weeds—one of the stages in reverting to prairie sod. There are other parcels which have not been broken.

Like many other areas in southern Alberta and Saskatchewan this dry land was at one time occupied by many more farmers than are there today. They attempted to farm there, but the vast majority failed. Drouth was the chief reason. There were a few who have been able to hold on, and a very few of these have accumulated a large acreage and have been quite successful. For them wheat is by far the major source of income. In such dry land areas wheat is the highest income-producing crop, and a farmer depending on a relatively small acreage in dry land farming has no alternative.

The yield data assembled for this particular district are not adequate to give a statistical interpretation of the history of the production in dry land farming but in other districts in Alberta and Saskatchewan where the physical characteristics of the land and the climate are similar, data on the history of the productivity of the land have been collected and analysed. The land in

these areas has been classified.¹ From the study of these areas it may be deducted that most of the dry land surrounding the Taber Irrigation District is marginal and submarginal for wheat production, except for the unusual operator who is able to exercise rare judgment in wheat farm management. Climate is the most important factor accounting for this marginality and submarginality in wheat production.

With frugal management over a period of years one would need more than a section of the better dry land in the Taber area to earn on an average the surplus obtained in farming less than 75 acres of irrigated land (Table 25) in 1939-40. In this connection it is interesting to note the experience of others in wheat production on the same kind of land in other areas during the same period.²

On farms predominantly in Land Classes I and II (submarginal and marginal wheat land) in the Eyebrow-Lacadena area of southern Saskatchewan for the year 1939-40 the operators obtained an average net income or surplus of approximately \$217.³ The farms averaged about 600 acres in size. The farm family cash living costs on these farms for that year averaged less than \$500. The farm family cash living costs for the small sized groups of farms in the Taber Irrigation District to which reference has been made averaged nearly \$800. While the selling price of wheat at 52 cents a bushel was low in 1939, crops (with wheat averaging nearly 14 bushels to the acre) on these lower land classes in the Eyebrow-Lacadena area were much better than usual. Over a long-time period on such land the average yield of wheat was less than 11 bushels per seeded acre. Grain farms in the Blucher-Colonsay area in central Saskatchewan in Land Classes I and II, in 1940 failed by nearly \$100 to meet operating, capital maintenance, and family cash living costs on the year's operation.⁴ The wheat yield on these farms in the lower land classes of the Blucher-Colonsay area for that year was 11 bushels. The farms averaged 532 acres in size. Farm family cash living costs averaged about \$545 per farm.

For the year 1938-39 (the year preceding that for which business statements on irrigation farming were obtained) the surplus above operating, capital maintenance, and farm family living costs averaged \$146 for the farms in Land Classes I and II in the Cardston-Pincher Creek-Macleod area.⁵ The year 1938 was a relatively good one for the farmers in this area, with wheat on the farms in these lower land classes averaging approximately 21 bushels per acre, which was much above the long-time average. The farms averaged about one section in size. Farm family living costs averaged about \$670 per farm.

Although the 1938 crop in the Cardston-Pincher Creek-Macleod area was above average, the yields usually obtained in this area range well above those from the dry land east of Taber. This is explained by the more westerly location of the former area with consequent higher elevation and greater precipitation (Figure 2). References will be made to this later.

The experience of others on land at least as productive as the more productive dry land surrounding Taber would indicate that from a section of land in the Taber area one could not expect under dry land farming to earn as large an income as on a farm of less than 75 acres irrigated and there would be less assurance of income.

¹ Stewart, A., and W. D. Porter, *op. cit.* Spence, C. C., and E. C. Hope, "An Economic Classification of Land in Fifty-Six Municipal Divisions, South Central Saskatchewan", Technical Bulletin No. 36, Dominion Department of Agriculture, Ottawa, 1941.

² Ibid.

³ Spence, C. C., S. Mysak and R. A. Stutt, "An Economic Classification of Land and Its Relation to Farm Income, Eyebrow-Lacadena Area, Saskatchewan, 1939-41", Dominion Department of Agriculture, Ottawa, 1941. Processed.

⁴ "An Economic Classification of Land and Its Relation to Farm Types and Income, Blucher-Colonsay Area, Saskatchewan, 1940-41", Dominion Department of Agriculture, Ottawa, 1944. Unpublished.

⁵ "An Economic Classification of Land and Its Relation to Farm Income, Cardston-Pincher Creek-Macleod Area, Alberta, 1938-39", Dominion Department of Agriculture, Ottawa, 1941. Unpublished.

The United Irrigation District.—A comparison of irrigation with dry land farming in districts farther to the west of those described in the foregoing presents a different picture. The United Irrigation District comprises an area of approximately 60,000 acres of which slightly more than 34,000 are irrigable. The District is located about 20 miles from the International Boundary and approximately 10 miles east of the fifth meridian. The most westerly point of the other irrigation districts described in the foregoing is about 70 miles east of the fifth meridian. The differences in precipitation between the far eastern and western irrigation districts were noted in an earlier section.

In 1939-40 the farmers in the United Irrigation District failed by nearly \$200 per farm to meet all expenses—current, operating, and living—as well as sufficient to maintain the farm capital. Farm family living costs averaged about \$600. The type of farming is somewhat varied but in general is a mixed grain-livestock type. Wheat made up 60 per cent of the cropped acreage. There were a few producing beets and a few farms where lambs were fattened. The latter group was the only one to obtain a surplus above all costs.

The farms in the United Irrigation District averaged 206 acres in size of which 108 acres were irrigated and 38 acres dry crop land. While the 108 acres were described as irrigated land during the year, not all of this was actually irrigated. The facilities were there, and although the farmers were assessed for their use, they did not make full use of them, particularly for the major crops grown. Wheat averaged about 14 bushels per seeded acre. Obviously this is about 100 per cent less than what it should be if the land is to be expected to carry the costs of irrigating. Yields of other crops should also be correspondingly higher. Alfalfa which constituted 13 per cent of the cropped land averaged a little more than one and one-half tons to the acre.

For 1938, the year which preceded the year of the survey of the farm businesses in the United Irrigation District, crop yields were about twice those of 1939. This was common to the whole southwestern part of Alberta. Timely rains and not irrigation were responsible. It is reasonable to assume that the average incomes of the farmers in the United Irrigation District were higher in 1938 than in 1939.

Almost joining the United Irrigation District on the east and on the west is the Cardston-Pincher Creek-Macleod area to which reference has previously been made. Farmers operate under dry land conditions and wheat is the major source of income.¹ For the crop year 1938-39, on grades of land comparable with that in the United Irrigation District, the operators of these Cardston-Pincher Creek-Macleod farms obtained average surpluses, on Land Class III of \$397, on Land Class IV of \$817, and on Land Class V about \$835. Average living cost of farm families on Land Class III was \$720, on Land Class IV \$950, and on Land Class V over \$1,100. While, as already noted, the 1938 yield was higher than the long-time average for the region such surpluses are not unusual for the dry farming area, particularly on the better land. The average size of these farms was between three-quarters and one section.

The natural conditions of this whole region arising from a combination of a clay loam to a clay textured soil within a relatively favoured precipitation belt give the area a comparatively high rating among the grain producing regions of the West. The United Irrigation District is located in the centre of this region. This is the most likely explanation of the United Irrigation District farmer's hesitancy about making full use of the Irrigation facilities provided.

Irrigation has a place, however, in the production of some crops in the United Irrigation District. Sufficiently higher yields of alfalfa and grasses can be obtained under irrigation to warrant irrigation in a livestock economy, provided the costs of irrigation are comparatively low. This is borne out by

¹ Ibid.

the experience of the farmers in the Mountain View Irrigation District located south of the United Irrigation District. With a relatively inexpensive plant, located close to the source of water the costs are less than one-third of those prevailing in most other irrigation districts. Irrigation is practically confined to the hay fields.

Full and profitable use of these facilities of the United Irrigation District may be possible under an economy such as exists in the Taber, Coaldale, and other districts where canning crops and sugar beets are produced. It appears, too, that feed enterprises would provide a means of increasing the income so that a surplus might be earned, provided advantage were taken of the irrigation facilities to produce heavy yields of alfalfa hay.

Farming in the Western Irrigation Block, Canadian Pacific Railway.—

The farmers in another of the more westerly irrigation districts appear to have had the same experience as have those of the United Irrigation District. The C.P.R. Western Section comprises an area of over a million acres of land of which the west boundary lies only about 20 miles east of Calgary. The area extends from the Bow River at the south to the Rosebud on the north. It is estimated that approximately 220,000 acres of this is irrigable of which one-third has been provided for in construction work and in obligation to service water. In 1939 less than 12,000 acres were irrigated.

This is largely a wheat and general-type farming area. In 1939 more than two-thirds of the acreage cropped was in wheat. Oats and barley which are the other two crops of importance are fed on the farm. Both cattle and hogs are raised. It is an extensive type of agriculture.

Of the land irrigated, alfalfa occupies more acres than any other crop. In 1939 this amounted to approximately 3,000 acres. In the main the C.P.R. Western irrigation district is quite characteristic of a number of the better wheat-growing areas in Western Canada. It is located within the dark brown soil belt, and hence is not subject to such extreme aridity as those areas farther east. The soil varies from a sandy loam to a clay, the greater part of the area being a silt to a clay loam. For the most part the topography is undulating to gently rolling with few obstructions to the successful operation of large mechanical units.

Under these natural conditions, as well as the lack of alternative paying crops, the size and organization of the farm unit became one of a general and wheat type, in spite of the engineering facilities provided for a more intensive

TABLE 38.—PERCENTAGE DISTRIBUTION OF FARMS BY SIZES IN REPRESENTATIVE WHEAT AREAS OF ALBERTA AND SASKATCHEWAN

	Size in Quarter Sections ¹				
	Less than One Quarter	One Quarter	Two Quarters	Three Quarters	Four Quarters and over
C.P.R. Western Section:	%	%	%	%	%
Alberta, R.M. 218.....	4	16	31	20	29
R.M. 219.....	5	16	28	14	37
R.M. 248.....	3	10	23	14	50
R.M. 249.....	3	15	28	17	36
Other Areas:					
Alberta, R.M. 158.....	2	18	30	14	36
R.M. 159.....	3	20	32	13	32
R.M. 278.....	4	16	27	17	36
Saskatchewan, R.M. 103.....		19	43	13	25
R.M. 104.....		18	40	16	26

¹ 1936 Census, Dominion of Canada.—Up to 100 acres=less than one quarter; 101 to 299 acres=one quarter; 300 to 479 acres=two quarters; 480 to 639 acres=three quarters; and 640 acres and over=four quarters and over.

type of agriculture. The outcome was that most farmers elected not to use the irrigation water, except for irrigating gardens, small fields on which fodder crops were grown, and for stock watering.

Evidence of this extensive type of farming in the C.P.R. Western irrigation block is observed in the density of the farms therein. According to the 1936 census in Rural Municipalities 218, 219, 248, and 249 which comprise this block the number of farms per township varies from 32 to 46. In the dry farming wheat area in the vicinity of Vulcan and Nanton, and comprising Rural Municipalities 158 and 159, the census reports for the same year an average density of 41 farms per township. In two representative rural municipalities¹ of a wheat type of farming in south central Saskatchewan the number of farms averaged 50 per township.

The same evidence of an extensive type of farming is presented in Table 38 which gives a distribution of the farms according to size groups for the municipalities to which reference has been made.

In 1936 in the four rural municipalities which contain the C.P.R. Western irrigation block 78 per cent of the total acreage in field crops was in wheat; in the other wheat area of Alberta with which it has been compared in the vicinity of Vulcan and Nanton 82 per cent was in wheat.

Cancellations of water agreements have been permitted by the company until at the time of the survey only on about one-fourth of the irrigable acreage of 1927 which was sold was there an existing agreement for water delivery. The greater part of this acreage was located on the eastern side of this irrigation project. In 1940 less than one-half of this was irrigated.

From the standpoint of precipitation and physical characteristics the general areas in which these western irrigation districts are located is quite comparable with the better wheat-growing areas of the prairies. From dry land farming the yields obtained have averaged about the same and with no greater variability. In contrast to those regions lying to the east, the area is less arid; summer rains are more frequent and can usually be depended upon to produce at least some crop. The whole environment is one that discourages rather than encourages irrigation on the part of the farmer.

Western Irrigation Districts Appraised.—In evaluating the land in these western irrigation districts from the standpoint of past performance and their probable future utilization in the present economy it would seem that the land is worth little more when irrigated. The best claim for irrigation in these areas is the nearness to the source of water supply. However in view of the much greater difference in the productivity of dry and irrigated lands in areas farther to the east it would appear better business from a national viewpoint to carry the water there where the land with irrigation is worth many times more than without.

Conclusions on Value of Irrigated and Dry Land.—To sum up: under the existing economy considered alone on earning capacity, land in the more westerly irrigation projects to which reference has been made has not higher dollar value under irrigation than under dry farming. Exception to this may be noted in the case of some more favourably located hay land which can be irrigated at relatively low cost. With the eastern districts the situation is different. In these eastern areas under dry farming, crop production is a hazardous undertaking. Under irrigation in a mixed farm type even where the choice must lean heavily to grains, farming can be made far less hazardous. The land can be made to produce and many thus can be assured of a living. Above this living the amount of surplus which can be earned will depend on the organization of the farm, which in turn is dependent on available markets.

¹ Rural Municipalities Sutton No. 103 and Gravelbourg No. 104.

In a mixed crop-livestock type of farming a farm of approximately 125 acres of irrigated land with some dry land for pasture may be expected to earn a surplus above current operating, capital maintenance, and average family living costs. Under the cost-price relationship which existed during the two years which preceded and the two years which followed the outbreak of the war, one could expect on an average this surplus to be adequate (at an interest rate not exceeding 5 per cent) to enable one over a period of years to pay out on a contract for the land a cost price of \$15 to \$20 per cultivated acre.¹ With a combination of such cost-price relationship and an economy such as that which exists in the areas where sugar beets are grown, the earnings possibly may warrant paying \$75 to \$80 per irrigated acre.² Confined to a unit of this size, without water, the land has little value.

FUTURE CONSIDERATIONS IN IRRIGATION FARMING

It is estimated that additional acres can be irrigated at a reasonable cost. The engineering accomplishment of this, however, is probably the minor consideration. Can farming in these proposed irrigated areas be made practical from a business standpoint? What chance for success has a settler in areas likely to be developed? Along what lines will his farm have to be organized? What may he expect in returns for himself and family, for immediate and future needs? What should be his own qualifications, and along what lines should he apply himself to ensure a reasonable degree of success? All these questions concern the individual. What concerns the individual in an organized irrigation district, of course, concerns a community, and the interests of a community are also those of the state.

In considering the expansion of irrigation farming in Alberta a conservative viewpoint would be to plan for a type of farming similar to that practised in many of the parkland regions of the West, plus one or two enterprises which could compete with those elsewhere in the province, and to exclude projects designed to provide the growing of bulky produce such as sugar beets and canning crops requiring the establishment of special marketing facilities.

At the outset irrigation farming is only feasible in areas where compact settlement may be made. This is determined by the area of land in a single block which may readily be made irrigable. Each of the existing irrigation districts are of such compact settlements large enough to support at least one fairly large village in its midst where those who service the surrounding farms live.

Suggested Farm Organization.—With the foregoing in mind a hypothetical farm set up has been envisaged (Table 39), based on the material presented in earlier sections of this report. The farm organization, anticipated receipts and expenses as well as the probable surplus for savings or paying on debts are given. Such an annual surplus amortized at 5 per cent will pay off a debt of \$2,779 over a period of 20 years. Assuming that the 115 acres of dry pasture land cost \$3 an acre then approximately \$19 per acre could be paid for the 125 acres under irrigation.

As noted, the organization of this farm is suggested by the combined experience of those in the several areas covered in the survey. Considerable weight has been given to the experience of the farmers in the Eastern Irrigation District in planning the farm set-up, as it is felt the types there are more like what may be expected for areas to be developed. It will be noted that some

¹ See page 128.

² The average "surplus" earned on 60 farms in Taber area 1939-40 amounted to \$345 (Table 25). An annual payment of \$345 will pay off a debt of \$4,300 in twenty years at 5 per cent. This is equivalent to \$82 per irrigated acre for the 60 farms.

modification is made in the average of existing cropping plans. This is to conform a little more closely with the better practices confirmed by experimental data. It is felt, however, that these crop rotations are practical where the contour of the land and other physical features permit the necessary field arrangement.

The yield estimates were the average for the eastern districts during the five-year period 1937 to 1941 and the prices used were generally for the same

TABLE 39.—BUDGET IRRIGATED FARM ONE QUARTER AND 80 ACRES: 125 ACRES IRRIGATED AND 115 ACRES DRY PASTURE LAND, MIXED CROP-LIVESTOCK TYPE

Crops Grown Two Rotations			
Crop rotation A	Acres	Crop rotation B	Acres
Wheat	10	Wheat	10
Oats	10	Barley	10
Peas	10	Barley (seeded down)	10
Barley (seeded down)	10	Alfalfa hay	10
Alfalfa and Brome	10	Alfalfa hay	10
Alfalfa and Brome	10	Alfalfa seed	10
	60		60
Irrigated pasture permanent			120 acres 5 acres
Total irrigated			125 acres
Yields			
20 acres wheat at 25 bu.	500 bu.	Crops:	Sales
10 acres oats at 45 bu.	450 bu.		
30 acres barley at 33 bu.	990 bu.	10,000 lb. peas at 2.5 cents....	\$250
10 acres peas at 1,000 lb.	10,000 lb.	750 lb. alfalfa seed at 20 cents..	150
10 acres alfalfa seed at 75 lb.	750 lb.	21 T. hay at \$7	147
30 acres alfalfa hay at 2 T.	60 T.		
10 acres alfalfa hay at 1 T.	10 T.	Total Crops	\$ 522
Feed required			
Livestock	Fodder	Grain	Livestock and livestock products sales
	T.	lb.	
9 cows	18.0	10,000	1,400 lb. butterfat at 25 cents..... \$350
2 heifers	2.0	...	
3 yearlings	1.5	...	
2 calves .....	...		3 yearlings at \$38
34 hogs	2.0	33,000	2 calves at \$15
100 hens	1.0	7,000	32 hogs at \$16
175 lambs	20.0	36,000	1,000 doz. eggs at 12.5 cents
2 horses	4.0	1,500	175 lambs at \$3
	48.5	87,500	Total livestock and livestock products sales
			\$1,656
Total receipts			\$2,178
Farm expenses			
Irrigation assessment 125 acres at \$1.60			\$ 200
Taxes			70
Tractor operating			180
Automobile operating			90
Equipment repairs			25
Building repairs			20
Seed			50
Feed			60
Threshing			125
Labour for irrigating and haying			200
Miscellaneous			100
Total cash expenses			\$1,095
Farm family living costs			600
Non-cash farm costs:			
Depreciation on machinery			\$185
Depreciation on buildings			75
Total non-cash farm costs			260
Total expenses			\$1,955
Surplus (to apply on debt or for savings)			223

period. As pointed out prices for grain during this period ranged below normal; but no grain has been sold in this budget statement nor has there been any purchased. The average price for alfalfa hay in this general area from 1921 to 1942 was \$8 a ton. There were years when it was considerably higher, and years when it went begging at \$4 a ton. The budget uses a figure of \$7. While it is believed the yield estimates are conservative, they are only reasonably so; the same is true of the prices. The latter too, it is believed are in line with the costs.

The cost items require little explanation. Earlier sections of the report dealt with chief items, such as irrigation costs, tractor operation costs, and labour required. At \$40 a month with board the wages allowed for labour are somewhat higher than those which prevailed over the area during the time of the field survey.

The farm family cash living expense is given at \$600. It will be observed that this is not the lowest living cost of any group of irrigated farms studied nor is it by any means the highest. As already noted this is used as cash remuneration of the operator for his labour and management, and in addition to this he has the use of a house to live in and the products and privileges which the farm furnishes him and his family.

The farmer's living is one of the first things to be considered in deciding the adequacy of farm income. In the long run this will determine whether or not the land will be farmed, and if it is to be farmed, the conditions under which it will be done.

As noted, the crop yields used in the budgetary statement are conservative. During a 30-year period under irrigation, alfalfa grown in 10-year rotations, manured twice in the rotation, averaged over 3 tons to the acre on the Dominion Experimental Station at Lethbridge.¹ Sugar beet yields have been more than doubled in less than 20 years, where grown in the irrigated regions of southern Alberta (Table 8). With accumulated experience it is reasonable to expect increased yields for other crops, also, under irrigation. Probably in time, yields as high as 50 per cent above those used in the farm operating statement of the 125-irrigated-acre farm set-up described will be quite common. With such yields, one could expect larger surplus earnings for meeting indebtedness or for savings than those calculated for the hypothetical farms; though it is more probable that the family living expenses would be increased with a higher level of living made possible. This, of course, is a desired objective.

The foregoing statement, of course, is predicated on higher yields than those being obtained on an average, at the present time, and also on the assumption that in the organization of his farm the operator would seek to maintain as favourable a combination of crops and livestock as possible from the pecuniary point of view. As has been shown, the equivalent income and even higher net income may be obtained from a farm unit of less than 75 irrigated acres, if the location of the farm will permit including among the crops such intensive ones as sugar beets and canning factory crops.

But there are factors other than size of the farm unit, of yields and combination of crops and livestock which affect the probable remuneration in irrigated farming. Two of these are the efficiency in the use of labour and efficiency in the use of capital. Less directly within the control of the individual farmer are the market outlets, and adequacy of water for irrigating. Only a limited reference to these other factors has been possible in this report, but all must be given consideration in planning the organization of the irrigated farm and a program for the future.

¹ Annual Reports, Field Husbandry, Dominion Experimental Station, Lethbridge, Alberta. Unpublished.

OTTAWA

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